Notice To Reader: The content of this document is only to illustrate the design and implementation of version 1.386. YD reserves the right to change the design and implementation in subsequent versions.

1. Quickstart

This chapter will demonstrate the necessary steps for investors to access and use the YD order management system (YD OMS) through a simple strategy program, and help investors establish a basic understanding of YD API.

1.1. Environment preparation

Initially, download the corresponding version of the API from https://www.hanlinit.com/download. Prior to downloading, please register an investor account on the official website and wait for approval.(YD promises that registered information will only be used for disseminating YD-related information and not for other purposes). Unzip the ydClient_1_386_XX_XX.tgz file after downloading, and use the tools and programs in the ydClient/win64 and ydAPI directories for the demonstration.Then, through using the Windows GUI client ydClient of YD, you can directly connect to the YD OMS and easily check the running results of the subsequent programs.

First, enter the ydClient/win64 directory and modify the YDConfig.ini file to the following content:

```
##########################################
######### Network configurations  #########
##########################################

# IP address of yd trading server
# TCP port of yd trading server, other ports will be delivered after logged in

TradingServerIP=118.190.175.212
TradingServerPort=41600

##########################################
######### Trading configurations  #########
##########################################

# Choose trading protocol, optional values are TCP, UDP, XTCP
TradingProtocol=TCP

# Timeout of select() when receiving order/trade notifications, in millisec. -1 indicates running without select()
TradingServerTimeout=10

# Affinity CPU ID for thread to send TCP trading and receive order/trade notifications, -1 indicates no need to set CPU affinity
TCPTradingCPUID=-1

# Affinity CPU ID for thread to send XTCP trading, -1 indicates no need to set CPU affinity
XTCPTradingCPUID=-1

##########################################
####### MarketData configurations  ########
##########################################

# Whether need to connect to TCP market data server
ConnectTCPMarketData=yes

# Timeout of select() when receiving TCP market data, in millisec. -1 indicates running without select()
TCPMarketDataTimeout=10

# Affinity CPU ID for thread to receive TCP market data, -1 indicate no need to set CPU affinity
TCPMarketDataCPUID=-1

# Whether need to receive UDP multicast market data
ReceiveUDPMarketData=no

##########################################
####### Misc configurations        ########
##########################################

AppID=yd_dev_1.0
```

```
48 AuthCode=ecbf8f06469eba63956b79705d95a603
```

The above configuration information points to an Internet test environment provided by YD for SHFE and INE. This environment operates around the clock, replaying market data from a specific trading day to facilitate investor debugging. For more details, please refer to https://www.hanlinit.com/docs/dev-environments/.

After completing the configuration, double-click YDClient.exe to run it, and use any one of the accounts 001, 002-099, 100(password same as username) to log in. Once logged in successfully, you can browse the content in various menus.

After completing the steps above, we will now embark on preparing the strategy program.

1.2. Strategy program

To compile an executable program, you need to prepare the YD sample program first. Please copy all the files from ydAPI/linux64, ydAPI/linclude, and ydAPI/example directories to the working folder of the Linux server, and use the following commands to compile:

```
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c ydExample.cpp -o ydExample.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example1.cpp -o Example1.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example2.cpp -o Example2.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example3.cpp -o Example3.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example4.cpp -o Example4.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example5.cpp -o Example5.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example6.cpp -o Example6.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example7.cpp -o Example7.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example8.cpp -o Example8.o
g++ -fpic -g -std=c++11 -c -O3 -pthread -Wall -c Example9.cpp -o Example9.o
g++ -g -std=c++11 -o ydExample -I. ./ydExample.o ./Example1.o ./Example2.o ./Example3.o ./Example4.o
./Example5.o ./Example6.o ./Example7.o ./Example8.o ./Example9.o -m64 -Wall -lpthread -lrt -ldl -Wl,-rpath,. -
L. -l:yd.so
```

After a successful compilation, copy the content from YDConfig.ini, as mentioned above, to the config.txt file. Then you can run the first sample program. Replace and with the credentials you use to log into the ydClient:

```
# ./ydExample <example name> <config file> <username> <password> <instrumentID>
./ydExample Example1 config.txt <username> <password> cu2306
```

When the following information appears, it means that the strategy program starts to execute, and please refer to the content about dmidecode in the Information Collection for the warning messages:

```
sudo: a password is required
login successfully
Position=0
sell open 1 at 71580
```

Please observe the changes of orders, trades, positions, and funds in the account detail interface of ydClient after trades occur.

So far, the first YD sample program has been compiled and run successfully. Investors can continue to try other sample programs and read these programs, which helps investors to quickly grasp the basic knowledge of the API. The following is a brief excerpt of the instructions for each example in ydExample:

```
All sample programs use the following strategy for a single product:
    If the buying volume in the market is 100 more than the selling volume, buy one lot at the counter price.
    If the selling volume in the market is 100 more than the buying volume, sell one lot at the counter price.
    The risk control restriction is that the position volume is not allowed to exceed 3.

The following sample programs demonstrate different levels of precision in position management:
Example1: Manages only executed positions, not order positions, and allow at most one pending order at a time.
Example2: Manages order positions based on order feedback for more precise position management.
Example3: Based on the previous example, the management of order positions based on self-issued orders has been
added to achieve more accurate position management. In addition,this example also demonstrates how to use
notifyCaughtUp to obtain information about catching up to the latest transaction records.
Example4: Using YDExtendedApi to achieve the same functionality can greatly simplify the program.
Example9: demonstrates how to use OrderGroup to implement reliable UDP order placement and cancel locally
generated orders.

```

```
The following sample programs are used to demonstrate other functions:
Example5: This program demonstrates how to send instructions for executing or abandoning options, as well as inquiring about them.
Example6: Demonstrates the utilization of the YDExtendedApi in a market maker's quoting system.
Example7: Provides a demonstration on how to utilize YDExtendedApi for uncomplicated risk monitoring and alerting.
Example8: Demonstrates how to use YDExtendedApi to automatically establish traditional combined positions
```

By studying the sample programs, you should have mastered the basic steps of writing YD strategy programs. Next, it is recommended that investors read the remaining contents of the documentation systematically. The documentation not only provides a detailed explanation of YD's basic principles and usage methods, but also offers tips and best practices for writing YD API programs.

If you encounter any problems during the reading process, feel free to contact the YD support team by email (support@hanlinit.com) or through your broker. The YD support team is happy to answer any questions you may have.

2. Basic concept

2.1. API selection

YD provides five different types of trading interfaces, including ydApi, ydExtendedApi, raw protocol, ydCTP, and Python interface, to meet various requirements of investors.

Raw protocol is the most flexible way to place orders. YD has publicly announced the uplink protocol for placing and canceling orders, as well as the downlink protocol for order notification, trade notification, error notification, etc. Investors can construct UDP packets for placing or canceling orders, or monitoring and analyzing downlink acknowledgment messages on their own. Raw protocol needs to be used in conjunction with the ydApi or ydExtendedApi. It is suitable for investors who are accustomed to using raw protocols to access OMSs. For details, refer to Raw Protocol.

ydCTP is a CTP-like API that simulates core functions of the CTP such as order placement and query, allowing programs that were developed based on CTP to connect to the YD trading system without modification. This makes it easier for investors who have not yet officially used the YD OMS to evaluate and test its performance and stability. However, due to the incompatible architecture between YD and CTP, ydCTP cannot cover all CTP interfaces, nor can it achieve behavior completely identical to native interfaces. Therefore, it is not recommended to use ydCTP for trading in a production environment. For details, please refer to the relevant documentation.

Please refer to the relevant documents in the ydClient package for more detailed information about YD python version API.

2.1.1. ydApi

ydApi is a high-performance API designed with the concept of simplicity and high efficiency. Its main responsibility is to send the investor's orders to the OMSs and notify the investor through the callback function after receiving the notifications. Generally, except for Static Data, the API does not retain any Dynamic Data like orders and trades. It also does not assist investors in calculating funds and positions, thus occupying minimal memory. Investors who use ydApi need to manage funds and positions based on their positions at the beginning of the day and the subsequent notifications such as orders and trades, and provide corresponding methods for queries. It is suitable for investors who are highly concerned about performance and have the ability to manage their own funds and positions.

If the High Availability feature is enabled, ydApi will occupy roughly equivalent memory as the amount of notification data for high availability recovery. Based on estimates, with 5 million orders without trades in a Linux 64-bit system, ydApi will occupy around 400M of memory. In actual production, due to the presence of trades, rejected orders, combinations, etc., it will occupy more memory in the same order volume situation.

ydApi possesses the following features:

- Thread safety: Any API method can be called at any time under any thread.
- Reentrant: Any API method can be called in any callback function.
- Pointer stability: The pointers to static data obtained through the "get" or "find" methods in ydApi will not change throughout the entire life cycle. The data pointed to by the pointer can be read at any time through the strategy program; However, the pointers of order notifications and trade notifications obtained through the "notify" callback interface are different, and the pointers of multiple notifications with the same "OrderSysID" are also different. The exception is that the pointers of static data sent back through "notifyCombPosition" method are stable.

YD currently provides three versions of the API: Linux 64-bit, Win 32-bit and Win 64-bit. The Linux 64-bit version of the API has been optimized extensively for the Linux platform and has significantly better performance than the two versions for Windows. It is a highly recommended version for production use. For investors who have to use Windows platforms, since the Win 32-bit program is only available for a 2G of user memory, it is suggested that investors use the 64-bit version in order to prevent the API from being frozen due to out-of-limit of memory.

2.1.2. ydExtendedApi

ydExtendedApi is a versatile API designed with the ideals of comprehensive functionality and ease of use. Based on inheriting all the functions and features of ydApi (ydExtendedApi is a subclass of ydApi), the API internally stores all the Dynamic Data such as orders and trades, etc. Based on these dynamic data, it helps investors manage funds and positions, and provides a variety of unique data structures and query methods at the cost of a very low downlink performance overhead and certain space occupation. The larger the transaction volume, the larger the space occupied. It is suitable for investors who are accustomed to using a full-featured API.

Since maintaining an extended data structure locally, ydExtendedApi occupies more space than ydApi. It is estimated that ydExtendedApi will occupy around 1400M of memory when the high availability feature is disabled in a Linux 64-bit system with 5 million unfilled orders. When the high availability feature is enabled, ydExtendedApi will occupy approximately 1800M of memory. In actual production, considering trades, error orders and combinations, etc., more space can be occupied under the same order volume.

The query methods of ydExtendedApi are all executed locally rather than at the OMSs. However, considering that all queries are locked, it costs a lot. The strategy program can save the pointers returned from the API and directly use the data pointed by the pointer in the subsequent execution process. In addition to inheriting the pointer stability feature of ydApi, any pointers obtained through the "get" or "find" methods of ydExtendedApi, as well as the pointers to extended dynamic data sent back by YDExtendedListener callbacks, are also stable.

2.2. Order modes

YD supports three types of order modes: TCP, UDP, and XTCP, which are different in terms of penetration performance and reliability. Investors can choose the order mode according to their own needs.

2.2.1. TCP order

The overall penetration delay of TCP order transmission mode is relatively high. The time consumption of an API order transmission mode itself (the time from calling the API order interface to the first byte of the order being sent to the fiber) is about 1-2 μs. The penetration to the OMS is around 8-10 μs, but it can ensure that the order is delivered to the OMS. When investors test or connect to the OMS through the Internet, it is recommended to use the TCP order transmission mode to avoid the problem of order loss caused by the firewall and other reasons.

In the same thread of TCP order transmission, it is also responsible for sending non-trading information (such as password modification) and receiving notification information sent by the OMS. Therefore, no matter what kind of order transmission mode is used, a thread for the TCP order transmission will definitely be created.

To use TCP order transmission, please set TradingProtocol=TCP in the API configuration file. Please refer to Configuration File for details.

2.2.2. UDP order

UDP order transmission mode has a low overall penetration delay. The time consumption for an API order itself is about 200 ns, while the OMS penetration is about 2-3 μs (depending on the different exchanges). The reference penetration value provided by YD Official is measured under the UDP order transmission mode. It is recommended that investors use UDP order transmission mode in production environment. UDP order transmission mode is only used for submitting uplink orders, and notifications are still sent through the original TCP channel.

For some investors who are concerned about the possibility of UDP order loss, firstly, the network conditions where the YD OMSs are located are usually stable, fast and idle. Unless there is a failure in modules, fibers, etc., loss of UDP order rarely happens; Secondly, YD provides notification function of OMSs. When investors receive an OMS notification, it means that the OMS has received the order. Even if it is lost, investors can still be aware of it. Please refer to the description of the OMS notifications in Order Notification for details.

To use UDP order transmission mode, set TradingProtocol=UDP in the API configuration file. Please refer to the Configuration File for details. If the OMS has not enabled UDP service, "false" will be returned every time the order interface is called. UDP order transmission mode does not have a dedicated thread for order submission. It will directly send orders in the thread that calls the order submission and cancellation interface. Therefore, please bind the calling thread to an isolated core to ensure the order submission performance.

2.2.3. XTCP order

The overall penetration delay of XTCP order transmission mode is relatively low， and the time consumption of API order transmission itself is about 250 ns. The penetration delay of the OMS compared to UDP order transmission mode is increased by less than 100 ns. Its operation mode is the same as UDP, which is only available for submitting uplink orders, and the notification is still returned through the original TCP channel.

Compared with UDP order transmission mode, the problem of order loss for XTCP can be completely eliminated and the prolongation of penetration delay is relatively short. It is suitable for investors who do not trust the UDP protocol. However, since the maintenance cost of TCP connection protocol stack is higher than that of UDP, investors should be cautious about using XTCP connection. If an XTCP thread is used widely, it will impose significant pressure on strategy host and the OMS.

To use XTCP order transmission mode, set TradingProtocol=XTCP in the API configuration file. Refer to the Configuration File for more details. If the XTCP service is disabled at the OMS, it will fall back to using TCP order transmission mode. Since the XTCP service is closed by default, please confirm with your broker whether they have enabled XTCP service before using it. In most cases, XTCP will directly place orders in the thread that calls the order submission and cancellation interface. Therefore, please bind the calling thread to an isolated core

to ensure order placement performance. TCP resend messages and TCP heartbeat messages are sent through a dedicated thread of XTCP. You can bind it by using the "XTCPTradingCPUID" parameter.

2.3. API thread

After the initiation of the YD API, three threads will be created: TCP notification receiving, TCP market data receiving and a timer. Orders are sent directly through calling the thread of "insertOrder", and therefore no dedicated thread is provided for handling order submission.

2.3.1. TCP notification receiving thread

The main task for the TCP notification receiving thread is to receive notifications and invoke YDListener callbacks, as well as heartbeats to OMSs. Most callbacks from YDListener or YDExtendedListener are initiated from this thread, except for "notifyMarketData". If the thread stays in a callback function for a long time (60 s) without exiting, it may cause a heartbeat timeout and lead to disconnection of the TCP connection. Therefore, it is recommended for investors to keep the processing time of each callback function as short as possible. You can set "TCPTradingCPUID" in the API configuration file to specify the CPU core to bind to.

There are two network listening modes for the TCP notification receiving thread: Busy polling and Select. If the busy polling mode is selected, the notification receiving speed will be quicker, however the CPU utilization rate under this mode will reach 100%. If the select mode is used, the thread will wait for the select timeout to continue with the next select, resulting in almost no CPU overhead. However, the notification receiving speed is slower compared to busy polling. The timeout value for the TradingServerTimeout can be set in the API configuration file. Please refer to the Trading Configuration for details.

In order to ensure the fairness in all connection receiving trading flows through OMSs, the OMSs can switch to the next connection when pushing 20 trading flows each time to a particular connection. This prevents any account from having an impact on the notification received by other existing connections when collecting all trading flows while logged in.

2.3.2. TCP market data receiving thread

The main task for the TCP market data receiving thread is to receive market data pushed by the gateway of the exchange, call back YDListener and send heartbeat messages to OMSs. The callback of notifyMarketData in YDListener is initiated from this thread, which is similar to the TCP notification thread. The processing of notifyMarketData also needs to be fast, otherwise it may cause the TCP connection of this thread to be disconnected. The CPU core to be bound can be specified by setting "TCPMarketDataCPUID" in the API configuration file.

There are two network listening modes for the TCP market data receiving thread: Busy polling and Select. If the busy polling mode is selected, the market data receiving speed will be quicker, but the CPU utilization rate under will reach 100%. If the Select mode is selected, the select function will wait for a specified time before timing out and continuing to the next select, which has almost no CPU overhead. However, the speed of receiving market data is slightly slower compared to the busy polling mode, with a delay of a few microseconds. The timeout for "TCPMarketDataTimeout" can be set in the API configuration file. Please refer to the Market Data Configuration for more details.

2.3.3. Timer thread

The timer thread is used for uniformly executing all timed tasks in the API. This thread wakes up regularly every other 1 millisecond. Each time the timer triggers, it asks each timed task whether to execute based on their own characteristics. At present, the timer thread is only used for notifying investors of the appropriate refresh time through Auto Mode of Fund Refresh Mechanism.

The timer thread cannot be turned off and can be bound to a specific CPU by setting the TimerCPUID in the API configuration file.

2.3.4. User-defined data

To facilitate investors in storing user data in the structures of the YD, based on the stable characteristics of YD's pointers, YD provides four fields: pUser, UserFloat, UserInt1 and UserInt2, in YDExchange, YDProduct, YDInstrument, YDMarketData, YDCombPositionDef, YDAccount, YDAccountExchangeInfo, YDAccountProductInfo and YDAccountInstrumentInfo.

The API will not modify the data set in these fields, including the following special scenarios **forever**:

- When calling function of "startDestroy()" to destroy the API, the space stored in pUser will not be released automatically.
- When a main-standby switchover occurs, as the above structure does not change, the data stored in the user-defined field will not be affected.

If the above fields are not sufficient to store user data, a structure can be defined and the pointer to that structure can be stored in pUser. Essentially, the API provides a continuous user-defined space of 24 bytes, where any value can be stored, breaking the API's pre-defined field boundaries for cross-field data storage. Investors can modify the field names, types, and numbers in the header file to meet actual needs, but ensure that the total length does not exceed 24 bytes.

2.4. Version rule

YD adopts a four-segment version number encoding rule with the format of a.b.c.d. Each release version will only modify one segment of the version number. YD makes the following commitments:

- a: Protocol Version Number - Changing the version number in this section will inevitably modify the protocol and render all previously released API versions incompatible. It may also include modifications to sections b and c. Only when the segment version number of the API is the same as that of OMSs, and the API version number a.b.c is lower than the OMSs' version number a.b.c, can the API function work properly on that version of OMSs. A higher version number in this section indicates a higher version, and if they are the same, the comparison continues with section b.
- b: Function version number - Adding this segment version number certainly means adding new functions, which also include the modified content of Segment c. A higher version number in this section indicates a higher version, and if they are the same, the comparison continues with section c.
- c: Patch version number - Increasing the version number in this segment can only contain bug-fixing patches and must be for an unreleased version. A larger version number in this segment indicates a higher version. If they are the same, continue comparing the d segment.
- d: Emergency patch version number - A version with this segment version number added, **in principle**, means only the patch content for fixing an emergency Bug can be included, which must refer to an officially released production version. However, in order to cope with rapidly changing business needs, YD may have to add new functions to the emergency patch while ensuring the version compatibility. The version with a higher version number at this segment means a higher version.

YD promises that all investors use the same version of YD, and no so-called special versions will be provided. However, considering the upgrade strategy and specifications of YD, it should be understood that during the trial operation and upgrade process, some investors may use a higher version of the OMS that have not been officially released to the whole market. Wish investors understand:

- After completing the internal testing phase of a version, YD will invite selected brokers who are willing and capable of taking risks, and possess strong operational and emergency handling capabilities in both business and technology, to conduct trial runs of the new version. The duration of the trial run is not fixed. The more content released in this version, the longer the trial run will usually last. Moreover, if new issues are fixed or new features are introduced during the trial run stage, the duration of the trial run will be further extended.
- After the trial operation, YD will release the official version to the entire market. At this time, all brokers can gradually upgrade to the latest version in batches. In order to ensure that YD has sufficient service manpower to handle various problems appeared during the upgrade process, the total number of upgrades per week will be limited during the first 1-2 weeks. Considering the current market share of the YD OMSs and the relatively conservative upgrading strategies adopted by some brokers, it will take 2-3 months for the entire market to complete the upgrade.

2.4.1. API version compatibility

Only when the segment version number of the API is the same as that of OMSs, and the segment version numbers a, b and c of the API are set between MinApiVersion and MaxApiVersion can the API connect and log in to OMSs normally, otherwise a log-in error message "YD_ERROR_TooHighApiVersion=62" or "YD_ERROR_TooLowApiVersion=58" will be received.

- If brokers do not make special settings, the default MaxApiVersion of OMSs is equal to the version of the OMSs. Under special circumstances, the highest API version supported by OMSs can be modified by configuring the "MaxApiVersion" parameter of OMS. The MaxApiVersion can only be set using the a.b.c format for version numbers. Comparing only the a.b.c segments of the version number allows urgent patches (modifying the fourth segment of the version number) for the API to be compatible with older versions of the OMS.
- If brokers do not make special settings, the default MinApiVersion of OMSs will be 1.0.0.

To obtain the current version, MaxApiVersion, and MinApiVersion of OMSs, please refer to System Parameters.

The version of API can be obtained by the following two different methods, or you can check the API version in the log file. For more details, please refer to Logging.

```
class YDApi
{
  virtual const char *getVersion(void)=0;
}

/// Same as getVersion inside YDApi, put here to get version without make api
YD_API_EXPORT const char *getYDVersion(void);
```

3. Life cycle

3.1. Creation

To create an API instance, you first need to determine whether to use ydApi or ydExtendedApi. The differences between these two APIs can be found in the API Selection. For more detailed distinctions, please refer to the relevant content in this document.

The process of creating an API is not allowed to call any system calls that create child processes, such as fork(), system(), exec(), vfork(), clone(), posi_spawn(), and so on, in order to avoid creating unexpected problems.

3.1.1. Create ydApi

If ydApi is selected, the creation process is approximately as follows:

```
// Create YDApi
YDApi *pApi=makeYDApi(configFilename);
if (pApi==NULL)
{
  printf("can not create API\n");
  exit(1);
}

// Create listener of Api
YDExampleListener *pListener=new YDExampleListener(...);
/// Start Api
if (!pApi->start(pListener))
{
  printf("can not start API\n");
  exit(1);
}
```

The makeYDApi function requires a configuration file as input. Please refer to the Configuration File for instructions and an example of how to configure it.

The YDExampleListener mentioned above is a subclass of the YDListener, which is implemented by investors themselves. All notification information is sent to the strategy program through the callback function of this subclass. Since the instance of YDListener is created by the strategy program, its life cycle should be maintained by the strategy program, which can be destroyed when necessary. The callback function of YDListener will be introduced in each functional section of this document.

The API can be started by calling ydApi.start and the parameter "pListener" cannot be empty. The notification will be made immediately without blocking after the function call. To prevent the program from exiting directly, the strategy program needs to add blocking code after a successful call.

```
virtual bool start(YDListener *pListener)=0;
```

3.1.2. Create ydExtendedApi

If ydExtendedApi is selected, the creation process is roughly as follows:

```
// Create YDApi
YDExtendedApi *pApi=makeYDExtendedApi(configFilename);
if (pApi==NULL)
{
  printf("can not create API\n");
  exit(1);
}
// Create listener of Api
YDExampleListener *pListener=new YDExampleListener(...);
/// Start Api
if (!pApi->start(pListener))
{
  printf("can not start API\n");
  exit(1);
```

```
}
```

It can be seen that except for calling makeYDExtendedApi to create an API instance, the other steps are the same as those for ydApi.

In order to facilitate users of the ydExtendedApi in receiving notifications about changes in extended messages, "startExtended" can be used to receive callback notifications from YDListener and YDExtendedListener at the same time when starting API.

```
// YDExample7Listener implements both YDListener and YDExtendedListener interfaces.
class YDExample7Listener: public YDListener, public YDExtendedListener {}

// Create YDApi
YDExtendedApi *pApi=makeYDExtendedApi(configFilename);
if (pApi==NULL)
{
  printf("can not create API\n");
  exit(1);
}
// Create listener of Api
YDExample7Listener *pListener=new YDExample7Listener(...);
/// Start Api, YDExtendedListener is used here
if (!pApi->startExtended(pListener,pListener))
{
  printf("can not start API\n");
  exit(1);
}
```

The function signature of "startExtended" is as follows： both parameters "pListener" and "pExtendedListener" shall not be empty. Except for the addition of the callback notification of "YDExtendedListener", this function is identical to "start":

```
virtual bool startExtended(YDListener *pListener,YDExtendedListener *pExtendedListener)=0;
```

The definition of "YDExtendedListener" is as follows. Compared to the structure sent back by "YDListener", the extended structure sent back by YDExtendedListener contains more information, which can facilitate investors in writing code. Please refer to ydDataStruct.h for the specific content of each extended structure.

```
class YDExtendedListener
{
public:
  virtual ~YDExtendedListener(void)
  {
  }
  // all address of parameters in following methods are fixed
  virtual void notifyExtendedOrder(const YDExtendedOrder *pOrder)
  {
  }
  virtual void notifyExtendedTrade(const YDExtendedTrade *pTrade)
  {
  }
  virtual void notifyExtendedQuote(const YDExtendedQuote *pQuote)
  {
  }
  virtual void notifyExtendedPosition(const YDExtendedPosition *pPosition)
  {
  }
  virtual void notifyExtendedAccount(const YDExtendedAccount *pAccount)
  {
  }
  // notifyExchangeCombPositionDetail and notifyExtendedSpotPosition will only be used when trading SSE/SZSE
  virtual void notifyExchangeCombPositionDetail(const YDExtendedCombPositionDetail *pCombPositionDetail)
  {
  }
  virtual void notifyExtendedSpotPosition(const YDExtendedSpotPosition *pSpotPosition)
  {
  }
};
```

3.1.3. Configuration file

When calling the makeYDApi method, the configuration file used by the client should be specified. The configuration file contains parameters mainly classified into three categories:

- Network configuration, including the IP address and port of ydServer. Please always fill in the port blank with the TCP port information provided by brokers. Other ports, including the UDP order port and TCP market data port, will be automatically provided after logging in. The option to enable UDP order transmission mode is controlled by the UDPTrading parameter.
- Trading configuration, including whether to use UDP for order transmission mode and selecting the working mode of the thread receiving the notification.
- Market data configuration, including receiving the TCP or UDP market data from ydServer or not.

The following shows the best practice template of the client configuration file provided by ydApi for production environment. The final effect of this template is that:

- UDP order tansmission mode can be used;
- TCP notifications can be received under the busy query mode, quickening the acquisition of notifications and binding the receiving thread to CPU 3.
- The RecalcMode feature for fund recalculation has been enabled. The setting for "ConnectTCPMarketData=no" will be overwritten as "yes", meaning market data will be received.

```
##########################################
######### Network configurations  #########
##########################################

# Count of recovery site. Used to achieve high availablity at the expense of a little performance of order notification.
# 0 for no recovery, 1 for recovery always use primary site, 2 for recovery use primary and secondary sites
RecoverySiteCount=0

# IP address of primary trading server
TradingServerIP=127.0.0.1

# TCP port of primary trading server, other ports will be delivered after logged in
TradingServerPort=51000

# IP address of secondary trading server.
# Valid only when RecoverySiteCount equals to 2.
TradingServerIP2=

# TCP port of secondary trading server, other ports will be delivered after logged in.
# Valid only when RecoverySiteCount equals to 2.
TradingServerPort2=

##########################################
######### Trading configurations  #########
##########################################

# Choose trading protocol, optional values are TCP, UDP, XTCP
TradingProtocol=UDP

# Affinity CPU ID for thread to receive order/trade notifications, -1 indicate no need to set CPU affinity
TCPTradingCPUID=-1

# Affinity CPU ID for thread to send XTCP trading, -1 indicate no need to set CPU affinity
XTCPTradingCPUID=-1

# Timeout of select() when receiving order/trade notifications, in millisec. -1 indicates running without select()
TradingServerTimeout=-1

# Work mode for recalculation of margin and position profit. Valid when using ydExtendedApi.
#     auto(default): subscribe market data and automatically recalculate in proper time.
#     subscribeOnly: subscribe market data and recalcMarginAndPositionProfit should be called explicitly
#     off: never do recalculation
```

```
RecalcMode=auto

# Gap between recalculations, in milliseconds. Valid when RecalcMode is set to auto.
# It will be adjusted to 1000 if less than 1000
RecalcMarginPositionProfitGap=1000

# Delay of recalculation after market data arrives to avoid collision with input order, in milliseconds.
# Valid when RecalcMode is set to auto. Should be between 0 and 100.
RecalcFreeGap=100

##########################################
####### MarketData configurations  ########
##########################################

# Whether need to connect to TCP market data server
ConnectTCPMarketData=no

# Timeout of select() when receiving TCP market data, in millisec. -1 indicates running without select()
TCPMarketDataTimeout=10

# Affinity CPU ID for thread to receive TCP market data, -1 indicate no need to set CPU affinity
TCPMarketDataCPUID=-1

# Whether need to receive UDP multicast market data
ReceiveUDPMarketData=no

##########################################
######### Other configurations  ###########
##########################################

AppID=yd_dev_1.0
AuthCode=ecbf8f06469eba63956b79705d95a603
```

3.1.3.1. Network configuration

The network configuration includes the IP address and port of the YD OMS. When trading in the production environment, please consult the technical department of the related broker for specific configuration details.

RecoverySiteCount: Count of high availability sites. When it is set to 0, the high availability feature for the API is not enabled. When set to 1, the high availability of the single OMS is enabled. When the OMS is restarted, the API will reconnect to the OMS and recover to the latest state as much as possible, preventing direct termination of the API. When set to 2, the primary-secondary dual OMS high availability feature is enabled. If the primary OMS fails, the backup OMS(specified in TradingServerIP2 and TradingServerPort2) will start, and the API will reconnect to the OMS and recover to the latest state. The use of high availability will result in little loss of notification performance.

TradingServerIP: IP address of the YD OMS.

TradingServerPort: The port of YD OMS. YD OMS usually opens three ports, which are TCP trading, TCP market data and UDP trading. The XTCP trading and UDP market data ports are closed by default. The TradingServerPort should be filled in with the TCP trading port. Other ports will be automatically provided to the client by the OMS after a successful login. Do not fill in the TradingServerPort with the UDP trading port, otherwise the YD OMS will not be connected. If orders are to be sent through UDP or XTCP, the parameters TradingProtocol=UDP or TradingProtocol=XTCP should be used for control.

UDPTradingServerPort: The port for UDP transmission mode. It is automatically provided by the OMS and is usually unnecessary to be filled in. However, when accessing the OMS from an external network through NAT, the port for the UDP transmission mode may change. In such cases, the assigned port will not be able to receive UDP order data correctly. Therefore, it is necessary to configure this parameter according to the actual port provided by the broker.

XTCPTradingServerPort: The port for XTCP transmission mode. It is automatically provided by the OMS and is usually unnecessary to be filled in. However, when accessing the OMS from an external network through NAT, the port for the XTCP transmission mode may change. In such cases, the assigned port will not be able to receive XTCP order data correctly. Therefore, it is necessary to configure this parameter according to the actual port provided by the broker.

TCPMarketDataServerPort: The port for TCP market data. It is automatically provided by the OMS and is usually unnecessary to be filled in. However, when accessing the OMS from an external network through NAT, the external port for the market data may change. In such cases, the assigned port will not be able to receive market data correctly. Therefore, it is necessary to configure this parameter according to the actual port provided by the broker.

TradingServerIP2: The IP address of YD backup OMS. This is effective only when the RecoverySiteCount is set to 2.

TradingServerPort2: The port number of YD backup OMS. The setting method is the same as TradingServerPort. It will be enabled when RecoverySiteCount is set to 2.

UDPTradingServerPort2: The UDP trading port of YD standby OMS. Its operation method is the same as that for UDPTradingServerPort. It will be enabled when RecoverySiteCount is set to 2.

XTCPTradingServerPort2: The XTCP trading port of YD standby OMS. Its operation method is the same as that for XTCPTradingServerPort. It will be enabled when RecoverySiteCount is set to 2.

TCPMarketDataServerPort2: The TCP market data port of YD standby OMS, the operation method is the same as that for TCPMarketDataServerPort. It can be enabled when RecoverySiteCount is set to 2.

3.1.3.2. Trading configuration

TradingProtocol: Order transmission mode. The optional order transmission modes are TCP, UDP and XTCP. Since the overall penetration performances of UDP and XTCP are much better than that of TCP, it is suggested to use UDP or XTCP order transmission mode in production environment. In order to ensure compatibility, if TradingProtocol is not set, the original configuration UDPTrading will be used.

UDPTradingType The implementation options for the UDP transaction sender are automatic, sf, exa, and socket. If this parameter is not specified, the default value is automatic. "socket" represents using the standard socket protocol stack, "sf" represents using Solaflare's ef_vi, "exa" represents using Exanic, "automatic" represents automatically selecting an appropriate sender implementation, which can be one of sf, exa, or socket. Due to the complexity of the production environment, there are cases where the sender implementation of other applications and the YD API are incompatible. This can result in automatic degradation of the API to socket sending, significantly reducing the API's sending performance. Therefore, it is recommended that investors using UDP trading enforce the corresponding sender implementation method. In case of conflicts, there will be significant error prompts or the YD API application may fail to start, making the problem easier to detect and avoiding significant performance degradation for investors who are unaware of the situation.

TCPTradingCPUID: For setting the affinity of the TCP sending order and receiving notification threads. - 1 means that no affinity needs to be set. Otherwise, it is the number of the CPU/Core.

XTCPTradingCPUID: For setting the affinity of the XTCP order sending thread. - 1 means that no affinity needs to be set. Otherwise, it is the number of the CPU/Core.

TradingServerTimeout: This parameter specifies how the TCP trading and receiving thread of YDListener use the listening network communication. When set to a positive integer value, it means that the thread can be used to listen the arrival of network data through the POSIX Select Mechanism. The listening gap is a specified value in milliseconds. When set to -1, the receiving thread will read messages in a non-blocking manner, and its CPU utilization rate will reach 100%. If the client does not allocate CPU/Core properly based on its own machine configuration and set the affinity between the thread and CPU/Core, it will severely impact the performance and significantly increase latency of the client program.

RecalcMode: Recalculation mode of margin and position profit/loss. The default value under this mode is "auto".

- auto: The margin and position profit/loss can be recalculated by API. API will automatically subscribe to the market data required for calculations. The refresh interval and delay time from the market can be controlled through the parameters "RecalcMarginPositionProfitGap" and "RecalcFreeGap". The TCP market data will be received forcefully.
- subscribeOnly: Only helps to automatically subscribe to the required market data, but investors need to call the "recalcMarginAndPositionProfit" method to recalculate. The TCP market data will be received forcefully.
- off: The margin and position profit/loss will not be recalculated. Investors should generally avoid using this mode.

RecalcMarginPositionProfitGap: The interval between two recalculations, measured in milliseconds. The default value is 1000ms. The minimum value is 1000ms, and If it is set below 1000ms, the system will automatically adjust it to 1000ms. This parameter is only effective when RecalcMode is set to "auto".

RecalcFreeGap: The time interval for delayed market data. In order to avoid clashes with the order submission time as much as possible, the recalculation should be made before or after the arrival of market data if possible. Investors can adjust the parameter based on different exchanges so that the market data can be recalculated during periods of low order activity. The unit is milliseconds, with a default value of 100 milliseconds. The delay must be kept within 0 - 100ms. When greater than 100ms, this value will be adjusted to 100ms. When less than 0, this value will be adjusted to 0. This parameter is only effective when RecalcMode is set to "auto".

3.1.3.3. Market data configuration

Please note that both TCP market data and UDP multicast market data from YD are not high-speed market data. At present, they can only be used by YD's server and client for calculating the margin and position profit/loss. If market data is needed for in production trading, please contact the related broker to receive the multicast market data.

ConnectTCPMarketData: Connect to the TCP market data service of ydServer or not? "Yes" means "Receiving allowed", and "No" means "Receiving not allowed".

TCPMarketDataTimeout: This parameter specifies how the TCP market data receiving thread of YDListener use the listening network communication. When set to a positive integer value, it means that the thread can be used to listen the arrival of network data through the POSIX Select Mechanism. The listening gap is a specified value in milliseconds. When set to -1, the receiving thread will read messages in a non-blocking manner, and its CPU utilization rate will reach 100%. If the client does not allocate CPU/Core properly based on its own machine configuration and set the affinity between the thread and CPU/Core, it will severely impact the performance and significantly increase latency of the client program.

TCPMarketDataCPUID: For setting the affinity of the TCP market data receiving thread. - 1 means that no affinity needs to be set. Otherwise, it is the number of the CPU/Core.

ReceiveUDPMarketData: Receive UDP multicast market data sent by ydServer or not. At present, the UDP multicast market data function of all YD OMSs is turned off. Please always keep this parameter as "No".

3.1.3.4. Other configurations

TimerCPUID: For setting CPUID of the timer thread for API.

AppID and AuthCode: When investors set AppID and AuthCode in the configuration file. When calling the function "login", they can leave the appID and authCode parameters as "NULL", and the API will then use the values configured in the configuration file.

LogDir: For specifying the log directory generated by ydApi ("log" by default). The directory will not be created automatically and needs to be manually created. If the corresponding directory does not exist, no log files will be generated.

3.1.3.5. User-defined configgguration

YD supports reading configuration content from configuration files. Investors can not only read the configuration information of YD API, but also put the user-defined configuration in YD's configuration file, which can be then accessed through the YD API.

When investors set user-defined configuration items, they should name them in the format of "Application name. parameter name", for example, MyApp.Username. Though a parameter without an application name can still be entered directly and used, but the API will report a warning message stating that the parameter is not being used when it starts. To avoid confusion, it is not recommended to use parameters without an application name.

YD's user-defined configuration supports listed parameters. Multiple parameters with the same name can be set to achieve this effect. The following shows the examples:

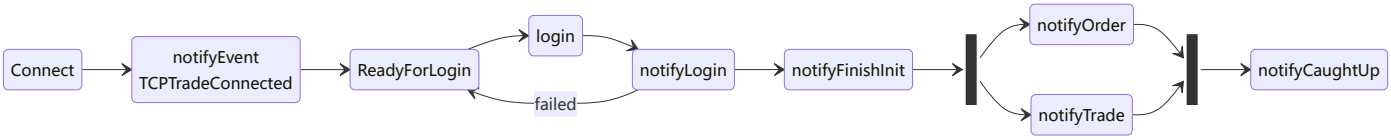
```
MyApp.TradeExchange=SHFE
MyApp.TradeExchange=INE
MyApp.TradeExchange=CFFEX
MyApp.TradeExchange=DCE
MyApp.TradeExchange=CZCE
```

The YD API provides two methods for obtaining customized parameters. The first method obtains a single customized parameter, and when it is a listed parameter, it returns the first set value in that list. The second method can obtain all parameter values of a list parameter. The notified result set needs to be manually destroyed by the investor after being used up through calling "destory()". When used for a single custom parameter, it will return a YDQueryResult collection containing a single element, which also needs to be destroyed using the "destroy()" function provided by the API to free up allocated memory.

```
/// get first config using this name in config file (parameter of makeYDApi or makeYDExtendedApi), NULL if not found
virtual const char *getConfig(const char *name)=0;
/// get all configs using this name,  user should call destroy method of return object to free memory after using
virtual YDQueryResult<char> *getConfigs(const char *name)=0;
```

3.2. Start

After creating an API instance and calling "start" or "startExtend" to start the API, the API will complete the startup initialization process according to the following steps.



3.2.1. Connect

After the instance is started, it will continuously connect to the OMS address and TCP port specified by TradingServerIP and TradingServerPort respectively until the connection is successful. Once connected, After the successful connection, a callback message showing "Connected" will be sent through "notifyEvent"(YD_AE_TCPTradeConnected).

If the API is configured with dual-host high availability mode, it will cycle through the primary OMS address and TCP port specified by TradingServerIP and TradingServerPort, as well as the backup OMS address and TCP port specified by TradingServerIP2 and TradingServerPort2, until a successful connection is established. After the successful connection, a callback message showing "Connected" will be sent through "notifyEvent"(YD_AE_TCPTradeConnected).

3.2.2. Login

After the successful connection, the strategy program will be notified immediately through the callback function "notifyReadyForLogin" that it is ready to attempt login. The parameter "hadLoginFailed" in this callback function refers to whether the initiation of the "notifyReadyForLogin" callback is caused by the last login failure. If yes, it will be unnecessary to log in again with exactly the same information since the failure is inevitable.

```
virtual void notifyReadyForLogin(bool hasLoginFailed)
```

After receiving the "notifyReadyForLogin" callback notification, the strategy program should typically call the "login" function immediately to initiate the "login". The login function signature is shown below. The username and password must be inputted when logging in. The penetralia regulatort information appID and authCode are optional:

- If appID and authCode are set to NULL, the API will use the AppID and AuthCode specified in the configuration file. If these two parameters are not configured in the configuration file, an error will be caused;
- If appID and authCode are set to specific values, the API will only use the parameters specified in the interface and will not use the values specified in the configuration file.

```
virtual bool login(const char *username,const char *password,const char *appID,const char *authCode)=0;
```

The following shows a common "login" code example:

```
virtual void notifyReadyForLogin(bool hasLoginFailed)
{
  if (!m_pApi->login(m_username,m_password,NULL,NULL))
  {
    printf("can not login\n");
    exit(1);
  }
}
```

The login result will be sent back through the callback of the function "notifyLogin" callback:

```
virtual void notifyLogin(int errorNo,int maxOrderRef,bool isMonitor)
```

If the errorNo of notifyLogin is "0", it means that the "login" is successful. If "isMonitor" is true, it indicates that the current logged-in user is the OMS administrator. If the logged-in user is a ordinary investor, it must be "false". maxOrderRef represents the maximum OrderRef received by the OrderGroupID of the OMS 0 at the time of login. For the maximum OrderRef of all order groups, please refer to Order Group. Except for the following three cases, no matter whether an order or quote order is successful or not, as long as the OrderRef of the new order or quote order is greater than the current MaxOrderRef of the order group, the MaxOrderRef of the current account will be modified to be the OrderRef of the order:

- Error orders and quotes caused by the monotonic increase check of the order number will not be included in MaxOrderRef;
- Error orders and quotes with order account identification failure due to the error of the network data packet received by OMSs will not be counted in MaxOrderRef. This error should not occur in general and It often occurs in cases where investors try to break our company's protocol to place orders or quote orders.
- Error orders caused by submitting the quote at an OMS that does not support the quote instruction (without authorized market maker function) will not be counted in MaxOrderRef.

After a successful login, the TCP market data port and UDP trading port issued by the OMS can be received by API. Therefore, it unnecessary for YD to specify the market data port, UDP trading port and XTCP trading port in the configuration file. However, in certain scenarios, such as accessing the OMS from the Internet, the mapped Internet port is usually different from the port issued by the OMS. If not processed, it will cause TCP market data connection failure or UDP trading being unable to send to the OMS. In this case, the TCP market data port or UDP trading port can be set mannually to override the automatically issued ports. The "TCPMarketDataServerPort" can be used to override the market data port, "UDPTradingServerPort" to override the UDP trading port, and "XTCPTradingServerPort" to override the XTCP trading port. If the dual-host high availability mode is configured, the "TCPMarketDataServerPort2" can be used to override the market data port of the standby OMS, the "UDPTradingServerPort2" to override the UDP trading port of the standby OMS, and the "XTCPTradingServerPort2" to override the XTCP trading port of the standby OMS.

If the "errorNo" of "notifyLogin" is not 0, it means that the login fails. The errorNo will inform the specific reason for the failure and it is unnecessary to use maxOrderRef and isMonitor since they are meaningless at this time. The API will wait for 3 s and then continue to callback "notifyReadyForLogin" to wait for the user to send a login request. At this time, the "hasLoginFailed" of "notifyReadyForLogin" will be set to "true". The reasons for login failure may include:

Error No.	Error definition	Description
12	YD_ERROR_InvalidClientAPP	AppID or AppAuthCode error.
18	YD_ERROR_AlreadyLogined	Current API login completed. Re-login is not allowed.
19	YD_ERROR_PasswordError	Wrong login password.
20	YD_ERROR_TooManyRequests	The number of login requests is beyond the limit.
21	YD_ERROR_InvalidUsername	Invalid login user.
27	YD_ERROR_InvalidAddress	The IP address of the client is not in the address range allowed for logging in. It is only valid for the administrator.
35	YD_ERROR_ClientReportError	Failure in collecting information for a penetrative regulatory inspection. Please refer to Look-through Supervision for more details.
50	YD_ERROR_TooManyLogines	The authorization of OMS restricts the number of accounts that can log in at the same time. When the login limit is reached, the subsequent accounts will not be able to log in unless the existing ones log out. No matter how many connections an account has, it is counted as one login account. In other words, only when all connections of the account are logged out and YDAccount.LoginCount is 0, the account can be regarded as logged out.
58	YD_ERROR_TooLowApiVersion	The API version is lower than the lowest version required by the OMS. Please refer to API Version Compatibility for details.
62	YD_ERROR_TooHighApiVersion	The API version is higher than the highest version supported by the OMS. Please refer to API Version Compatibility for details.

3.2.2.1. Trading day

The Trading day can be sent back to the API together with the login notifications starting from the "notifyLogin" callback, and investors can use getTradingDay to get the trading day.

```
virtual int getTradingDay(void)
```

Trading days of YD OMSs are calculated based on the system time (For day trading hours, a trading day is set as the date of that natural day. The trading day before 24:00:00 (in night trading hours) is considered as the date of the next non-holiday, and after 24:00:00 (in night trading hours), if that natural day is a trading day, will be considered as the date of that natural day. If that natural day is a holiday, the trading day will be considered as the date of the next non-holiday). The Trading day calculated based on the production environment is usually accurate, but in the testing environment, it may be inconsistent with "YDMarketData.TradingDay", which is probably because that a past preday data

has been used, the trading day of the exchange's test environment is not switched, or a man-made trading day is used during a weekend test.

3.2.2.2. Look-through supervision

According to regulatory requirements, there are two main parts to the penetrative supervision mechanism.
The first part is to specify the AppID and AuthCode of the client system during login, and the second part is to report information about the login system's server. The following will introduce these two mechanisms separately.

3.2.2.2.1. AppID and AuthCode

AppID and AuthCode are essentially the username and password of the client system, such as the strategy system, that uses API to access the OMS. The client system must first meet brokers' access testing requirements before connecting to the OMS. After passing the test, the broker will add the AppID and AuthCode representing the system to the OMS. Then, any account can connect to the OMS through this client system. It is obviously that the AppID and AuthCode of the client system are not bound to the username and password of an investor account.

> The ydClient client provided by YD has its own fixed AppID and AuthCode embedded within the client. The AppID and AuthCode of this client are also added by default to the list of allowed systems on the OMS. Therefore, any investor can log in to the OMS through ydClient.

YD does not restrict the naming format of AppID, but there are regulatory requirements for AppID. It is suggested to name your client system according to regulatory requirements. The regulatory requirements for AppID are as follows:

- AppID consists of three parts, namely manufacturer name, software name and version number. The maximum length of each part is 10, 10 and 8 characters respectively.
- AppID should follow the following format: manufacturer name_software name_version number, e.g.: yd_client_1.0;
- For terminal software developed by individuals, the manufacturer name should be fixed as "client". Since most investors using the YD system have their own self-developed systems, the manufacturer name should be fixed as "client".

Since AuthCode belongs to the information from the client system, the AuthCode entered to YD OMSs needs to be specified by the investors to ensure that the client system has the same authorized code in all OMS.

When YD checks the AppID and AuthCode information pairs, it simply compares whether the characters are consistent with the information shown in the OMS background list and will not treat AuthCode as encrypted information.

3.2.2.2.2. Information collection

The information that needs to be collected for regulation includes two parts, one of which must be collected from the client server and the other can be collected from the OMS. YD API will automatically collect the client server information for regulation from the client server. The information collected varies depending on the type of terminal operating system. The following only shows the information collected from the client server:

```
Windows: Terminal Type (fixed to 1) @ Information Collection Time @ Private Network IP1 @ Private Network IP2 @ Network Card MAC Address 1 @ Network Card MAC Address 2 @ Device Name @ Operating System Version @ Hard Disk SN (serial number) @ CPU SN @ BIOS SN @ System Disk Partition Information.
Linux: Terminal Type (fixed to 2) @ Information Collection Time @ Private IP1 @ Private IP2 @ Network Card MAC Address 1 @ Network Card MAC Address 2 @ Device Name @ Operating System Version @ Hard Disk SN @ CPU SN @ BIOS SN.
```

The following are examples of information collected by two types of operating systems. If an investor wants to view the information collected and reported to the OMS by API (the API version must be higher than 1.122), they can create a "log" directory in the current directory of the program. After logging in, they can see the following penetrative collection information in the logs under the "log" directory:

```
1@2022-08-12 09:13:13@192.168.6.1@192.168.80.1@005056C00001@005056C00008@MI@6.2@0100_0000_0000_0@BFEBFBFF000806C1@33481/01QV@C,FA668A82,NTFS,475
2@2022-08-10 20:50:02@192.168.15.21@@5254003A3DF5@@test@3.10.@@078BFBFF00050654@Not Specified
```

> During the information collection process in Linux system, BIOS SNs can be collected by YD API through the dmidecode program. Generally, if no special settings are made, normal users do not have the execution permission of this program. Users running the client system must be provided with the execution permission of this program to ensure a complete information collection. YD will first check whether dmidecode has been given suid. If it has, it will be executed directly. If not, it will be executed through sudo dmidecode. Investors can add suid to this program through the command "chmod +x /usr/sbin/dmidecode".

When the OMS parameter "ClientReportCheck" is set to "enforce", if the OMS finds incomplete collection information during the information collection check, such as the hard disk SN of the second Linux sample mentioned above is not collected, the client login will not be allowed, and a login error of "YD_ERROR_ClientReportError" will be generated. The following shows the operating system commands used by YD API for information collection. If the collected information is found incomplete, please manually execute the corresponding collection method to confirm whether the command execution results are normal. Please execute the command with the same operating system user as the client system to ensure that problems caused by insufficient permissions (the majority of the reasons for failing to obtain data) are discovered.

- Windows Hard disk SN: Get-WmiObject -Query "SELECT SerialNumber FROM Win32_PhysicalMedia";
- Windows CPU SN: Get-WmiObject -Query "SELECT ProcessorID FROM Win32_Processor";
- Windows BIOS SN: Get-WmiObject -Query "SELECT SerialNumber FROM Win32_BIOS";
- Linux Hard Disk SN: First, find the device NAME whose TYPE is "disk" through "/bin/lsblk -dn -o TYPE,NAME", and then call "/sbin/udevadm info –query=all –name=/dev/{NAME}" to get the serial number of this device;
- Linux BIOS SN: /usr/sbin/dmidecode -s system-serial-number.

3.2.3. Receive Static Data

In order to reduce the impact of the OMS queries on the OMS, all query services of YD are executed locally, which requires that the client and server have exactly the same data. This principle applies to both ydApi and ydExtendedApi. The difference is that ydApi only involves static data, while ydExtendedApi like the OMS, in addition to having static data, also manages dynamic data such as funds, positions, orders, trades and so on. Therefore, query services for funds, positions, orders and trades on ydExtendedApi are also provided locally.

Static data refers to the data that will not change within a trading day, such as the instrument, preday margin rate, preday commission rate, and account settings, etc. Each type of preday data has its corresponding structure for data storage, for example, the instrument data and account data correspond to "YDInstrument" and "YDAccount", respectively. Because some structures contain both static data and dynamic data at the same time, for example, the presettlement price (PreSettlementPrice) in the market data structure "YDMarketData" is static data, however the last price (LastPrice) is dynamic data. During the static data collection phase, a YD OMS only sends static data and does not guarantee the correctness of the dynamic data part of the structure. Therefore, it is necessary to only use the static data in each structure during the static data collection phase, and do not use dynamic data,otherwise unknown errors may be caused. The static and dynamic parts of each data structure will be indicated separately in the following text. Unless otherwise specified, all fields in the whole structure corresponding to these static data are static.

> As the volume of preday data significantly increases, especially the traditional portfolio positions defined by DCE, the time required to receive static data has increased significantly. In order to accelerate the transmission speed, in version 1.386, when the API of version 1.386 is integrated with the trading system of the version 1.386, the trading system will send compressed preday data, thereby greatly reducing the transmission time. Therefore, if you want to speed up the reception of static data, please upgrade the API to the version 1.386.

After a successful login, the OMS will start to push static data. After the data is received by API, the market data connnection and XTCP (if enabled) connection will be established. The "notifyFinishInit" will be called back to notify the strategy program that all static data has been loaded regardless of whether the connection is successful or not, which provides investors a time point to prepare for the subsequent receipt of order and trade notifications, including obtaining information such as preday funds, positions, margin rates, and commission rates, etc.

```
1 virtual void notifyFinishInit(void)
```

In addition to knowing the completion of the static data push through the callback function, YD API also provides a synchronous query function to check whether the static data push is completed. If you do not want to receive callback messages during the static function receiving phase, this function can be used to determine whether the current initialization data is complete or not.

```
1 virtual bool hasFinishedInit(void)=0
```

The static data of YD will be introduced one by one below. The functions involved in the following content can be used normally in "notifyFinishedInit" callback and afterwards.

3.2.3.1. Exchanges

YD currently supports a total of 8 exchanges, including China Financial Futures Exchange (CFFEX), Shanghai Futures Exchange (SHFE), Shanghai International Energy Exchange (INE), Dalian Commodity Exchange (DCE), Guangzhou Futures Exchange (GFEX), China Zhengzhou Commodity Exchange (CZCE), Shanghai Stock Exchange (SSE, option) and Shenzhen Stock Exchange (SZSE, option). It also supports configuring connections to all exchanges on one OMS. SHFE and INE are usually configured on one YD OMS, and therefore, YD provides two sets of methods for traversing and searching for exchanges, as shown below:

```
virtual int getExchangeCount(void)=0
virtual const YDExchange *getExchange(int pos)=0
virtual const YDExchange *getExchangeByID(const char *exchangeID)=0
```

The first two methods can be used for traversing all exchanges, the specific methods are shown in the code below:

```
for(int i = 0; i < pApi->getExchangeCount(); i++) {
  YDExchange *exchange = pApi->getExchange(i);
}
```

The last method can be used for specifying and searching for a single exchange, and the invocation for searching each exchange is shown below:

```
pApi->getExchangeByID("CFFEX")  //CFFEX
pApi->getExchangeByID("SHFE")   //SHFE
pApi->getExchangeByID("INE")    //INE
pApi->getExchangeByID("DCE")    //DCE
pApi->getExchangeByID("GFEX")   //GFEX
pApi->getExchangeByID("CZCE")   //CZCE
pApi->getExchangeByID("SSE")    //SSE
pApi->getExchangeByID("SZSE")   //SZSE
```

All fields in the YDExchange structure are static data, and most of them are used to indicate whether a certain functionality is supported. Therefore, if you want to know the meaning and usage of a specific field in detail, please search for that field in this document to obtain a complete introduction related to that functionality.

3.2.3.2. Products

YD provides two sets of methods for traversing and searching products.

```
virtual int getProductCount(void)=0;
virtual const YDProduct *getProduct(int pos)=0;
virtual const YDProduct *getProductByID(const char *productID)=0;
```

The first two methods can be used for traversing all products of all exchanges, if multiple exchanges are configured on a YD OMS at this time. The specific methods are shown in the following code:

```
for(int i = 0; i < pApi->getProductCount(); i++) {
  YDProduct *product = pApi->getProduct(i);
}
```

The last method can be used to specify and search for a product. The following shows a invocation example for searching for a product. If you want to know the expressions of all YD products, please use the above method to traverse and view "YDProduct.ProductID" one by one:

```
pApi->getProductByID("cu")
pApi->getProductByID("cu_o")
pApi->getProductByID("IC")
```

All fields in the YDProduct structure are static data, most of which are consistent with those of YDInstrument. They also include the attributes that should belong to an instrument, such as "Multiple", "Tick", "UnderlyingMultiple", "MaxMarketOrderVolume", "MinMarketOrderVolume", "MaxLimitOrderVolume" and "MinLimitOrderVolume". The original meaning of them is that when the corresponding fields on the instrument are not assigned, they can be used as their default values. However, at present, all instruments have their attribute values properly set, and there will be no null values. Therefore, the instrument attributes on "YDProduct" have little significance. For the meanings of the fields, please refer to the relevant content of Instrument.

m_ PMarginProduct is used for calculating large-side margins and cross-product large-side margins. Please refer to Margin Deduction for details.

3.2.3.3. Instrument

YD provides two sets of methods for traversing and searching for instruments.

```
virtual int getInstrumentCount(void)=0
virtual const YDInstrument *getInstrument(int pos)=0
virtual const YDInstrument *getInstrumentByID(const char *instrumentID)=0
```

The first two methods can be used for traversing all instruments. If multiple exchanges are configured on a YD OMS at this time, the instruments of all exchanges will be traversed. The specific methods are shown in the following code:

```
for(int i = 0; i < pApi->getInstrumentCount(); i++) {
  YDInstrument *instrument = pApi->getInstrument(i);
}
```

The last method can be used to specify and search for an instrument. The following shows a invocation example for searching for an instrument. If you want to know the expressions of all YD instruments, please use the above method to traverse and view "YDInstrument.InstrumentID" one by one:

```
pApi->getInstrumentByID("cu2208")
```

"YDInstrument" is the core data structure of the YD system. Except for the "AutoSubscribed" and "UserSubscribed" fields, all other data are static. The following will introduce the meanings of key fields:

Field	Description
InstrumentID	Instrument code, e.g.: cu2208, SP c2211&c2301
InstrumentHint	Hinted instrument information, applicable to the ETF options of SSE/SZSE, for example: 510050C2009M02350
ProductClass	Product class of instrument YD_PC_Futures=1: futures YD_PC_Options=2: Options YD_PC_Combination=3: combination, e.g.: SP c2211&c2301. At present, arbitrage instruments for DCE and CZCE are supported YD_PC_Index=4: index, e.g.: CSI 300 index YD_PC_Cash=5: cash, e.g.: CSI 300ETF
DeliveryYear	Delivery year, e.g.: 2022
DeliveryMonth	Delivery month, e.g.: "1" represents January, and "12" represents December.
ExpireDate	Expiration date of instrument, e.g.: 20220808
ExpireTradingDayCount	The number of trading days (excluding weekends and holidays) between the current trading day and the expiration date of the instrument. Since the calculation of the remaining days depends on the trading calendar, for instruments that expire in the next year, the calculation of the remaining days is only accurate after the exchange officially releases the trading calendar for the next year at the end of the current year. Otherwise, the trading calendar required for the remaining day calculation is estimated by YD, which may differ from the remaining days calculated based on the official trading calendar. If it is the last trading day, the value will be "0".
Multiple	Instrument multiplier, the multiple relative to the underlying asset.
Tick	Minimum price change.
MaxMarketOrderVolume	Maximum volume of market price orders.
MinMarketOrderVolume	Minimum volume of market price orders, the order volume must be a multiple of it.
MaxLimitOrderVolume	Maximum volume of price-limited orders.
MinLimitOrderVolume	Minimum volume of price-limited orders, the order volume must be a multiple of it.
OptionsType	Option type YD_OT_NotOption=0: non-option YD_OT_CallOption=1: call option YD_OT_PutOption=2: put option

Field	Description
StrikePrice	Strike price, valid only when the instrument aims to an option
m_pUnderlyingInstrument	The underlying instrument's pointer of an option instrument, which can be used to obtain the relevant information about the underlying instrument. This is only valid when the instrument aims to an option
UnderlyingMultiply	Underlying multiplier, the multiplier of the option relative to its underlying instrument, which is only valid when the instrument aims to an option It is always "1" for other non-option instruments
m_pMarketData	Pointer to the market data structure, which can be used to obtain market data. This market data structure can be refreshed continuously with the change of the market data.
m_pLegInstrument[2]	Only applicable to combined instruments. m_pLegInstrument[0] points to the left leg instrument of a combined instrument, m_pLegInstrument[1] points to the right leg instrument of a combined instrument
LegDirction[2]	Only applicable to combined instruments. LegDirction[0] represents the trading direction of the left leg instrument of a combined instrument, and LegDirction[1] represents the trading direction of the right leg instrument of a combined instrument
m_pCombPositionDef[2][YD_MaxHedgeFlag]	Only applicable to combined instruments. m_pCombPositionDef[0] points to the combined definition array of each hedge flag when buying a combined instrument, m_pCombPositionDef[1] points to the combined definition array of each hedge flag when selling a combined instrument. The hedge flags should be converted to array subscripts through a reduction by "1".

Assume that the instrument multiplier of a futures is "5", which means that a per-lot futures instrument corresponds to 5 units of underlying assets. If the option of this per-lot futures instrument corresponds to two-lot of futures instrument, the "UnderlyingMultiply" of the option will be 2, and the instrument multiplier of this option will be $5 \times 2 = 10$, indicating that the option of the per-lot futures instrument corresponds to 10 units of underlying assets.

3.2.3.4. Traditional combined position definition

In the traditional margin model, the traditional combined position definition of DCE, GFEX, CZCE, SSE and SZSE can be queried through the following two APIs.

The first method aims to traverse all traditional combined position definitions. Firstly, obtain the count n of all traditional combined position definitions through the function "getCombPositionDefCount", and then traverse all traditional combined position definitions one by one from 0 to n-1 through the function "getCombPositionDef".

```
// Traversing all traditional combined position definitions by SNs
virtual int getCombPositionDefCount(void)=0;
virtual const YDCombPositionDef *getCombPositionDef(int pos)=0;
```

The second method aims to query a specific traditional combined position definition according to traditional combined position definition names and combined hedge flags. Traditional combined position definition names (combPositionID) are not completely consistent with those of exchanges. Please refer to the following text for the definitions of the traditional combined position definition names and combined hedge flags.

```
// Querying a traditional combined position definition according to traditional combined position definition names and hedge flags
virtual const YDCombPositionDef *getCombPositionDefByID(const char *combPositionID,int combHedgeFlag)=0;
```

The information of "YDCombPositionDef" obtained through the above APIs is as follows:

Statement	Description
YDInstrumentID CombPositionID	Traditional combined position definition names, e.g.: pg2302,-eg2303 c2207-C-2240,-c2207-C-2240 20008571,-20008572
int CombPositionRef	Internal reference No. of traditional combined position definitions

Statement	Description
int ExchangeRef	Internal reference No. of exchanges
int Priority	Priority of traditional combined position definitions. The smaller the number, the higher the priority. It may be -1, indicating that the traditional combined positions of an exchange are not subject to priority management, for example, CZCE
short CombHedgeFlag	Hedge flags of traditional combined position definitions, which can be of the following types: YD_CHF_SpecSpec: speculation - speculation YD_CHF_SpecHedge: speculation - hedge YD_CHF_HedgeHedge: hedge - hedge YD_CHF_HedgeSpec: hedge - speculation
short CombPositionType	Types of traditional combined position definitions. The types of traditional combined position definitions of each exchange are shown in the following table.
double Parameter	Parameter, provided with different meanings in different exchanges. At present, it is applicable only to option offset, buying option vertical spread and buying option and futures combination in DCE and GFEX. It represents a combined margin discount. 0.2 means the combined margin is 20% of the total of the original two-legged margins.
const YDExchange *m_pExchange	Pointer of YDExchange.
const YDInstrument *m_pInstrument[2]	Two-legged instrument of traditional combined position definition. The order of the two legs may not be the same as the order of CombPositionID, and YD can order them automatically depending on the business process.
int PositionDirection[2]	Corresponding to the two-leg position direction of m_pInstrument
int HedgeFlag[2]	Corresponding to the two-leg hedge flags of m_pInstrument
int PositionDate[2]	Corresponding to the two-leg position date of m_pInstrument. Currently, all positions are historical positions.

The types of traditional combined positions for each exchange are shown in the following table.

Exchange	Type of traditional combined positions	Description
DCE	YD_CPT_DCE_FuturesOffset=0	Futures offset
DCE	YD_CPT_DCE_OptionsOffset=1	Options offset
DCE	YD_CPT_DCE_FuturesCalendarSpread=2	Futures calendar spread
DCE	YD_CPT_DCE_FuturesProductSpread=3	Futures cross-product spread
DCE	YD_CPT_DCE_BuyOptionsVerticalSpread=4	Vertical spread of buy options
DCE	YD_CPT_DCE_SellOptionsVerticalSpread=5	Vertical spread of sell options
DCE	YD_CPT_DCE_OptionsStraddle=7	Straddle put options
DCE	YD_CPT_DCE_OptionsStrangle=8	Strangle Put options
DCE	YD_CPT_DCE_BuyOptionsCovered=9	Buy option covered
DCE	YD_CPT_DCE_SellOptionsCovered=10	Sell option covered
GFEX	YD_CPT_GFEX_FuturesOffset=0	Futures offset
GFEX	YD_CPT_GFEX_OptionsOffset=1	Options offset
GFEX	YD_CPT_GFEX_FuturesCalendarSpread=2	Futures calendar spread
GFEX	YD_CPT_GFEX_FuturesProductSpread=3	Futures cross-product spread
GFEX	YD_CPT_GFEX_BuyOptionsVerticalSpread=4	Vertical spread of buy options
GFEX	YD_CPT_GFEX_SellOptionsVerticalSpread=5	Vertical spread of sell options

Exchange	Type of traditional combined positions	Description
GFEX	YD_CPT_GFEX_OptionsStraddle=7	Straddle put options
GFEX	YD_CPT_GFEX_OptionsStrangle=8	Strangle Put options
GFEX	YD_CPT_GFEX_BuyOptionsCovered=9	Buy option covered
GFEX	YD_CPT_GFEX_SellOptionsCovered=10	Sell option covered
CZCE	YD_CPT_CZCE_Spread=50	Spread
CZCE	YD_CPT_CZCE_StraddleStrangle=51	Short straddle or strangle
CZCE	YD_CPT_CZCE_SellOptionConvered=52	Sell option covered
SSE, SZSE	YD_CPT_StockOption_CNSJC=100	Bull call spread
SSE, SZSE	YD_CPT_StockOption_CXSJC=101	Bear call spread
SSE, SZSE	YD_CPT_StockOption_PNSJC=102	Bull put spread
SSE, SZSE	YD_CPT_StockOption_PXSJC=103	Bear put spread
SSE, SZSE	YD_CPT_StockOption_KS=104	Short straddle
SSE, SZSE	YD_CPT_StockOption_KKS=105	Short strangle

3.2.3.5. Preday market data

To obtain preday market data, the market data structure "YDMarketData" should be accessed through the "m_pMarketData" pointer of instruments.

Most of the information from "YDMarketData" is dynamic. Only those fields related to the previous trading day are static data. The static data part is shown in the following table:

Field	Description
TradingDay	Current trading day
PreSettlementPrice	Pre-settlement price
PreClosePrice	Pre-close price
PreOpenInterest	Pre-position volume
UpperLimitPrice	Upper limit price
LowerLimitPrice	Lower limit price

3.2.3.6. Account

For ordinary investors, the YD system only provides one way to obtain their account information, which can only be used by investors. Administrator users are not allowed to use this method.

```
// ydApi and ydExtendedApi can be called
virtual const YDAccount *getMyAccount(void)

// Only ydExtendedApi can be called
virtual const YDExtendedAccount *getExtendedAccount(const YDAccount *pAccount=NULL)
```

The static data of YDAccount and YDExtendedAccount is shown in the following table:

Field	Description
AccountID	Fund account
PreBalance	Pre-balance
WarningLevel1	Risk warning level 1. Useless now, just ignore it

Field	Description
WarningLevel2	Risk warning level 2. Useless now, just ignore it
AccountFlag	Account function switch

AccountFlag is a bitmap where each binary position with 1 indicates the function is enabled and 0 indicates the function is disabled. Assuming the investor has enabled the functionality of the OMS Notification, Slow Freezing After Position Closing and Order Number Checking, then the decimal number of the AccountFlag will be 112, and the corresponding binary number will be 0b1110000.

The following code can be used to check whether the function of "YD_AF_NotifyOrderAccept" is enabled:

```
if (myAccount->AccountFlag & YD_AF_NotifyOrderAccept) {
  // server notification enabled
}
```

The list of functionalities that can be controlled at the account level is as follows:

Switch value	Description
YD_AF_SelectConnection	For determining whether the result of connection preference can be uploaded to the OMS for all users' operation, refer to Connection Preference for details.
YD_AF_AutoMakeCombPosition	**Not Suggested**. For determining whether it can be combined through a broker's ydAutoCP. Refer to Auto tool for details.
YD_AF_BareProtocol	For determining whether to allow orders made based on a raw protocol, refer to Raw Protocol for details.
YD_AF_DisableSelfTradeCheck	For determining whether to disable the self-trading check, refer to Self-Trading Check for details.
YD_AF_NotifyOrderAccept	For determining whether to send the OMS notifications through the OMS, refer to Order Notification for details.
YD_AF_NoCloseFrozenOnInsertOrder	For determining whether to freeze positions immediately when closing positions, refer to Emergency Position Closing for details.
YD_AF_OrderRefCheck	For determining whether to check the monotonic increase of OrderRef. Refer to Monotonic Increase Check of Order Numbers for details.

3.2.3.7. Preday positions

Preday positions include derivative positions and spot positions. A derivative position means the position of futures and options. A spot position refers to the position of spot varieties (such as SSE and SZSE 300ETF). Since the basic operation of preday position is traversing, the real-time position can be calculated based on preday position, so YD only provides a method for traversing all preday positions.

```
// Derivatives
virtual int getPrePositionCount(void)=0
virtual const YDPrePosition *getPrePosition(int pos)=0

// Spots
virtual int getSpotPrePositionCount(void)=0
virtual const YDSpotPrePosition *getSpotPrePosition(int pos)=0
```

The method for traversing all positions is as follows. The following method is shown by taking derivative position as an example, which is the same as that used for traversing spot position:

```
for(int i = 0; i < pApi->getPrePositionCount(); i++) {
  YDPrePosition *prePosition = pApi->getPrePosition(i);
}
```

The preday position data of derivatives and spots are completely static.

The preday position structure of derivatives is as follows:

Field	Description

Field	Description
m_pAccount	Position account
m_pInstrument	Position instrument
PositionDirection	Position direction
HedgeFlag	Hedge flag
PrePosition	Preday position
PreSettlementPrice	Pre settlement price
AverageOpenPrice	Average open price

The preday position structure of spots is as follows:

Field	Description
m_pAccount	Position account
m_pInstrument	Position instrument
Position	Preday position
ExchangeFrozenVolume	Frozen volume of exchange
ExecAllocatedVolume	Net executed allocated volume - a positive value represents the receipt of securities, and a negative value represents the delivery of securities
ExecAllocatedAmount	Net executed frozen amount - a negative value represents a frozen amount, which should be deducted from an available amount and accordingly cannot be positive

> In accordance with Clause 2 of Article 55 of the Rules of China Securities Depository and Clearing Co., Ltd on Pilot Settlement of Stock Options of Shanghai Stock Exchange:
>
> According to the inspection results as well as the principle of "proportional allocation" and "allocation by mantissa", the Company makes an exercise assignment to the effective exercise party and the exercised party, sends the exercise assignment results to the settlement participants, and locks the instrument underlying required for exercise delivery in the securities account corresponding to the instrument account of the put option exercise party. **The maintenance margin corresponding to the assigned instrument of the clearing participants of the exercised party will not be released.**
>
> In accordance with Clause 1 of Article 58 of the Rules of China Securities Depository and Clearing Co., Ltd on Pilot Settlement of Stock Options of Shanghai Stock Exchange:
>
> If the settlement participants of the payable instrument underlying fail to deliver the instrument underlying amount, **the Company will settle the undelivered part in cash at 110% of the closing price of the instrument underlying on that very day**, unless otherwise specified by the Company.

According to the regulatory requirements, the formula for calculating the net exercise allocation amount of YD on Day E+1 is the following, E refers to the exercise day:

$$\mathrm{NetExerciseAllocation} = min(\mathrm{NetExerciseSettlement} + \mathrm{NetSecurityLackPenalty}, \mathrm{NetMaintainMargin})$$

The items involved in the above formula are defined as follows:

- Net exercise settlement is the original settlement amount calculated based on the pairs settlement results after closing on day E. A positive value refers to a collected amount, and a negative value refers to a paid amount.
- The net security lack penalty is the fund frozen in advance to prevent the securities delivery noncompliance. A negative value means that the penalty should be frozen. 0 means no penalty, which should not be a positive value. In the pairs settlement results after closing on E, $\mathrm{SecurityLack} = max((\mathrm{SecurityDeliverable} - \mathrm{SecurityReceivable}) - (\mathrm{SecurityTotal} - \mathrm{SecurityFrozen}), 0)$, then $\mathrm{NetSecurityLackPenalty} = -\mathrm{SecuritiesLack} \times \mathrm{SpotClosePriceOnDayE} \times (1 + 10\%) \times (1 + 10\%)$, where the first 10% should be paid according to the regulatory requirements, and the second 10% should only be frozen according to the upper limit since the instrument is unsure in case of a default.
- The net maintain margin is the fund frozen on day E+1 according to the option instrument and regulatory requirements. A negative value means the margin should be frozen, 0 means no margin, which should not be positive.

3.2.3.8. Traditional combined preday position

In the traditional margin model, traditional combined preday position data is static. Theoretically, it should also be transmitted during static data transmission, namely, before the function "notifyFinishInit" operation. However, in order to achieve the compatibility with the old version of API, it is always transmitted to the client immediately after the function "notifyFinishInit" and before the functon "notifyCaughtUp" operations. Although the transmission time is different from that for other static data, traditional combined preday positions, just like other static data, can only be pushed once at the first login. That is to say, if there is a "notifyFinishInit" callback, it can be pushed to the client, however, it will not be pushed repeatedly even due to disconnection and other reasons. The traditional combined preday positions can be introduced together with other static data for the sake of proper concept and easy understanding.

For an API, no any query interface has been provided, so it can only collect all traditional combined preday positions relying on the "notifyCombPosition" callback function.

```
virtual void notifyCombPosition(const YDCombPosition *pCombPosition,const YDCombPositionDef
*pCombPositionDef,const YDAccount *pAccount)
```

All fields of the "YDCombPosition" structure are static data, which should be used together with other parameters involved in the callback:

Parameter	Field	Description
pAccount		Position account
pCombPositionDef		Traditional combined position definition
pCombPosition	Position	Position volume
	CombPositionDetailID	Traditional combined position details ID, which is only meaningful to SSE and SZSE

3.2.3.9. System parameter

System parameters are those used in the calculation process. Currently, they are only used for margin calculation.

YD provides two methods for traversing and searching for data.

```
virtual int getSystemParamCount(void)=0
virtual const YDSystemParam *getSystemParam(int pos)=0
virtual const YDSystemParam *getSystemParamByName(const char *name,const char *target)=0
```

The first two methods can be used for traversing all system parameters. The specific method is shown in the following code:

```
for(int i = 0; i < pApi->getSystemParamCount(); i++) {
  YDSystemParam *param = pApi->getSystemParam(i);
}
```

The third method can be used for specifying and searching for system parameters. The following shows an example for call searching:

```
getSystemParamByName("MarginBasePrice", "Futures")
```

The YDSystemParam data is static, and its structure is as follows:

Field	Description
Name	Parameter name
Target	Applicable targets of parameters
Value	Parameter value

The above Name and Target are strings. Possible combinations are shown in the following table:

Name	Target	Value
MarginLowerBoundaryCoef	MarginCalcMethod1	The boundary coefficient in the stock index option margin algorithm, the floating point number, default: 0.5

Name	Target	Value
MarginBasePrice	Futures or Options	The base prices used for calculating the margin of futures or short positions of option can be selected as follows: 0: Pre settlement price 1: Opening price 2: Latest price 3: Average market price 4: The higher value between the latest price and pre settlement price According to the current common rules, the base prices used for futures and options shall be 1 and 4, respectively
OrderMarginBasePrice	Futures or Options	The base prices used for calculating the frozen margin of open position orders for futures or put options can be selected as follows: 0: Pre settlement price 5: Order price (for market price orders, use the upper limit price) 7: Use the MarginBasePrice price According to the current common rules, the base prices used for futures and options shall be 5 and 0, respectively Note that the frozen margin in the application for option execution is always calculated based on the pre settlement price
MarginBasePriceAsUnderlying	Options	The underlying product prices used for calculating the put option margin can be selected as follows: 0: Pre settlement price 2: Latest price 4: The higher value between the latest price and pre settlement price According to the current common rules, the underlying product price used shall be 0
SellOrderPremiumBasePrice	Options	The base prices used for calculating the reversely frozen premium when selling open position options can be selected as follows: 0: Pre settlement price 5: Order price (for market price orders, use the lower limit price) 6: Non-reverse freezing According to the current common rules, the base prices used shall be 6 Note that the premium frozen when buying open position options is always the order price (for market price orders, use the upper limit price)
PortfolioMarginConcession	DCELongOptionPortfolio	For the traditional combined positions with long option positions included in DCE and GFEX, the following values can be selected to determine whether to reduce the calculated margin: 0: Without reduction 1: With reduction. Since YD does not check the funds when closing positions, in extreme cases, it may lead to overdraft of funds due to overcharge of margin when closing positions after buying option combinations.
UseCollateral	Account	When the collateral funds obtained from collaterals are included in the pre equity for open position, the following values can be selected: 0: Disable 1: Enable
MarketMaker	System	Does the OMS support market maker quote or not yes: Yes no: No
Test	System	Is the OMS a test system? A test system does not involve performance optimization and cannot be used for production
ServerVersion	System	Version number of the OMS. Refer to Version Rules for the detailed version number specification

Name	Target	Value
ConnectionMode	System	Connection modes of the OMS: 0: Full-management connection 1: First connection - management and other connection - non-management 2: Full-non-management connection 3: The full-management connection, used as a non-management one, can only be used in SHFE and CFFEX
MinApiVersion	System	Minimum API version number supported by the OMS. Refer to Version Rules for the detailed version number specification
MaxApiVersion	System	Maximum API version number supported by the OMS. Refer to Version Rules for the detailed version number specification
MinSelectConnectionGap	System	Minimum time gap for reporting the connection optimization result, in milliseconds
MaxSelectConnectionGap	System	Maximum effective time for reporting the connection optimization result, in milliseconds
MissingOrderGap	System	Timeout of an unknown order determined by the system, in milliseconds.
UDPTradingPort	System	UDP trading port, which will be 0 when the UDP service is disabled on the OMS.
XTCPTradingPort	System	XTCP trading port, which will be 0 when the XTCP service is disabled on the OMS.
TradingSegmentDetail	System	Is the detailed trading segment announcement enabled? yes: Yes no: No

3.2.3.10. Commission rate settings

Generally, The setting values for the fee rates are infrequent. For example, to set the fee rates at the product level for all investors, just make a record at the product level. The YD system can apply this set value to all investors' instruments involving the product, which is easier for users to view than those set one by one. These set values are mainly used for showing on the YD interface and of no practical significance for ordinary investors. For the expanded results of the actual commission rates, refer to Account Level Information.

The following shows how to obtain the setting value of commission rates, which are for reference only, no more details will be provided here.

```
// Set commission rate
virtual int getCommissionRateCount(void)=0
virtual const YDCommissionRate *getCommissionRate(int pos)=0
```

3.2.3.11. Message Count Commission Rate

The message count commission rate encompasses the standards for commission charged by various exchanges. Given that certain products from some exchanges have not initiated the levying of the message count commission, the method described below will exclusively retrieve parameter information related to the products for which message count commission have been imposed:

```
// message count commission rate
virtual int getMessageCommissionRateCount(void)=0
virtual const YDMessageCommissionRate *getMessageCommissionRate(int pos)=0
```

The field information for YDMessageCommissionRate is as follows:

Field	Description
ProductRef	Product reference
MessageCount	Message count level
OTR	OTR level

Field	Description
CommissionRate	message count commission rate

The Order-to-Trade Ratio (OTR) and message count disclosed by exchanges are interval values, whereas YD provides level parameters. The correspondence between the two is depicted in the following two tables.

The following is the copper futures (cu) message count commission rate announced by the exchange:

	$OTR \leq 2$	$OTR > 2$
$1 \leq message\ count \leq 4000$	0 yuan/count	0 yuan/count
$4001 \leq message\ count \leq 8000$	0.25 yuan/count	0.5 yuan/count
$4001 \leq message\ count \leq 8000$	1.25 yuan/count	2.5 yuan/count
$40001 \leq message\ count$	25 yuan/count	50 yuan/count

The following are the corresponding settings for YD, assuming that the ProductRef for copper futures (cu) is 8:

ProductRef	OTR	MessageCount	CommissionRate
8	0	0	0
8	0	4000	0.25
8	0	8000	1.25
8	0	40000	25
8	2	0	0
8	2	4000	0.5
8	2	8000	2.5
8	2	40000	50

Let's presume that a certain investor has an message count of 9000 on a cu contract, with a corresponding OTR of 3. Therefore, the message count commission calculated using the segment accumulation method would be:

- First segment: 4000 total, commission of 0 yuan
- Second segment: 4000 total, commission of 4000*0.5 = 2000 yuan
- Third segment: 4000 total, commission of 1000*2.5 = 2500 yuan
- The total message count commission amounts to 4500 yuan.

3.2.3.12. Traditional margin parameters

Generally, The setting values for the margin rates are infrequent. For example, to set the traditional margin rates at the product level for all investors, just make a record at the product level. The YD system can apply this set value to all investors' instruments involving the product, which is easier for users to view than those set one by one. These set values are mainly used for showing on the YD interface and of no practical significance for ordinary investors. For the expanded results of the traditional margin rate of a specific instrument, refer to Account Level Information.

The following is a method to obtain the setting values for traditional margin rates, provided for reference only without detailed explanation.

```
// margin rate setting value
virtual int getMarginRateCount(void)=0
virtual const YDMarginRate *getMarginRate(int pos)=0
```

3.2.3.13. Account level information

The account level information provides exchange-level, product-level and instrument-level margin rates, commission rates, rights and traditional risk control parameters, which is a structure for investors to obtain these parameters. The following shows the description of these types of information:

- Commission rates are static information, while margins are dynamic data, which can be adjusted during trading. Therefore, the preday margins, commission rates and margin rates obtained through notifyFinishInit are instrument level information. For the sake of easy operation, API provides a method to directly obtain the instrument level margin rates and commission rates. Refer to Margin Model and Commission for details;
- Rights are dynamic data, which can be adjusted during trading. Margin parameters are set at all levels, however, they must be used at the instrument level. The API does not directly provide a method to query instrument level rights, which can be used automatically according to the method mentioned in Trading Right;
- Traditional risk control parameters are static. The risk control parameters of YD can be set at the product and instrument levels. For example, the cancellation volume set at the product level means that the total all instrument-based cancellation volume involving the product is limited. Therefore, the risk control parameters should be obtained from the product and instrument levels, respectively. Refer to Risk Control Parameters for details.

The information at all levels regarding an account can be obtained directly through the following functions:

```
/// when trader call following 3 functions, pAccount should be NULL
virtual const YDAccountExchangeInfo *getAccountExchangeInfo(const YDExchange *pExchange,const YDAccount *pAccount=NULL)
virtual const YDAccountProductInfo *getAccountProductInfo(const YDProduct *pProduct,const YDAccount *pAccount=NULL)
virtual const YDAccountInstrumentInfo *getAccountInstrumentInfo(const YDInstrument *pInstrument,const YDAccount *pAccount=NULL)
```

The main fields of YDAccountExchangeInfo are as follows, and their primary keys are accounts and exchanges:

Field	Description
m_pAccount	Account structure pointer
m_pExchange	Exchange structure pointer
TradingRight	Trading right, dynamic data
IsDedicatedConnectionID	Dedicated connection array bitmap, refer to Designated Seat for details
TradingCode[YD_MaxHedgeFlag]	Array of trading codes，trading codes under different hedge flag can be obtained.

The main fields of "YDAccountProductInfo" are as follows, and their primary keys are accounts and products:

Field	Description
m_pAccount	Account structure pointer
m_pExchange	Exchange structure pointer
TradingRight	Trading right, dynamic data
TradingConstraints[YD_MaxHedgeFlag]	Traditional risk control parameter array for speculation, hedge and spread, indicating that the risk control indicators of all instruments regarding the product are added and then controlled. Refer to Risk Control Parameters for details

The main fields of "YDAccountInstrumentInfo" are as follows, and their primary keys are accounts and instruments:

Field	Description
m_pAccount	Account structure pointer
m_pExchange	Exchange structure pointer
TradingRight	Trading right, dynamic data
TradingConstraints[YD_MaxHedgeFlag]	Traditional risk control parameter array for speculation, hedge and spread, indicating that only the thresholds of the risk control indicators regarding an instrument is limited. Refer to Risk Control Parameters for details
m_pMarginRate[YD_MaxHedgeFlag]	Margin rate array, refer to Margin for details
m_pCommissionRate[YD_MaxHedgeFlag]	Commission rate array, refer to Commission for details

Field	Description
RFQCount	Inquiry order count, only includes option inquiry orders for Shanghai Futures Exchange and China Energy Exchange.
ExemptMessageCommissionYDOrderFlag	If the YDOrderFlag of the order is greater than this flag, the information declaration fee will not be calculated.
MaxMessage	The maximum information limit is the upper limit, and exceeding this limit will prohibit order placement on this instrument.

3.2.3.14. Combination margin parameters

In the portfolio margin model, the combination margin parameters are derived from exchange's preday data and cannot be modified during trading hours. To accommodate combination margin parameters from all exchanges, Yida adopts a universal expression format using key-value pairs, where the meaning of each key-value pair is parsed by respective combination margin models. For more information about the portfolio margin model, please refer to Portfolio Margin Model。

YD provides the following method to traverse all margin models:

```
virtual int getMarginModelParamCount(void)=0;
virtual const YDMarginModelParam *getMarginModelParam(int pos)=0;
```

The structure of YDMarginModelParam is as follows:

Field	Description
MarginModelID	Margin Model ID
ParamName	Parameter Name
ParamValue	Parameter Value

Taking the CZCE SPBM parameters as an example, the returned margin parameters are shown in the table below. The margin model ID for CZCE SPBM is 1.

MarginModelID	ParamName	ParamValue
1	MA.intraRateY	0.7
1	MA.fut.cvf	10
1	MA.fut.MA211.price	2603
1	MA.fut.MA211.marginRate	0.2
1	MA.fut.MA211.timeRange	SPOT
1	MA.fut.MA211.lockRateX	0.2
1	MA.fut.MA211.addOnRate	0

The above data is equivalent to the information in the original file issued by CZCE, as shown below:

```
<?xml version="1.0" encoding="utf-8"?>
<spbmFile>
  <version>1.00</version>
  <exchange>ZCE</exchange>
  <exchangeName>China Zhengzhou Commodity Exchange</exchangeName>
  <createdDate>20221101</createdDate>
  <createdTime>150229</createdTime>
  <productFamily>
    <productFamilyCode>MA</productFamilyCode>
    <intraRateY>70.00</intraRateY>
    <futPf>
      <pfCode>MA</pfCode>
      <pfName>Methanol futures</pfName>
```

```
      <cvf>10</cvf>
      <fut>
        <month>202211</month>
        <futCode>MA211</futCode>
        <price>2603.00</price>
        <marginRate>20.00</marginRate>
        <timeRange>SPOT</timeRange>
        <lockRateX>20.00</lockRateX>
        <addOnRate>0.00</addOnRate>
      </fut>
    </futPf>
  </productFamily>
</spbmFile>
```

3.2.3.15. Account combination margin parameters

In the portfolio margin model, you can obtain the parameters of an investor on a specific margin model using the following method.

```
virtual const YDAccountMarginModelInfo *getAccountMarginModelInfo(int marginModelID,const YDAccount
*pAccount=NULL)
```

The fields of the YDAccountMarginModelInfo structure are as follows:

Field	Description
AccountRef	Account number. obtained from YDAccount.
MarginModelID	Margin Model ID
CloseVerify	Whether to check usable funds when closing positions.
MarginRatio	Margin Ratio
ProductRange	Applicable product range. Separated by spaces, it represents the subset of products that are applicable to the corresponding portfolio margin model. An empty value indicates no restriction on the product range, consistent with the portfolio margin model.

If there are changes in 'CloseVerify' or 'MarginRatio' during trading hours, investors will be notified through the following callback function. Please note that 'ProductRange' cannot be modified during trading hours.

```
virtual void notifyAccountMarginModelInfo(const YDAccountMarginModelInfo *pAccountMarginModelInfo)
```

For more information about the portfolio margin model, please refer to Portfolio Margin Model。

3.2.3.16. Risk control parameters

For the YD system, two types of risk control parameters can be provided according to technical implementation, which are traditional risk control parameters and general risk control parameters.

- Traditional risk control parameters are subject to the risk control rules supported by YD in the early stage, which mainly involve the control of common open position volume, trade volume, position volume and cancellation counts. Traditional risk control parameters do not increase continuously. Parameters subject to the new risk control rules are all set in the General Risk Control Parameters;
- General risk control parameters are introduced for adapting to the increasingly flexible and complex risk control rules. Their setting structure aims to general settings, which should be interpreted according to each risk control rule. Unlike those final values mentioned in Account Level Information, general risk control parameters do not merge with those risk control parameters set at different dimensions, and therefore investors should merge them according to the levels supported by each risk control rule.

The fields of the traditional risk control parameter structure are shown in the following table. Combined with the "TradingConstraints[YD_MaxHedgeFlag]" of "YDAccountProductInfo" and "YDAccountInstrumentInfo", complete risk control parameters under different hedge flags can be obtained. Refer to the specific risk control rules mentioned in Risk Control for the detailed calculation method based on the risk control rules.

Field	Description
OpenLimit	Position volume limit

Field	Description
DirectionOpenLimit[2]	Buy/sell open position volume limit
PositionLimit	Position limit
DirectionPositionLimit[2]	Long/short position limit
TradeVolumeLimit	Trade volume limit
CancelLimit	Order cancellation limit

Parameters based on general risk control rules can be obtained through the following traversing method:

```
virtual int getGeneralRiskParamCount(void)=0;
virtual const YDGeneralRiskParam *getGeneralRiskParam(int pos)=0;
```

The sample code for traversing all parameters based general risk control rules is as follows:

```
for(int i = 0; i < pApi->getGeneralRiskParamCount(); i++) {
  YDGeneralRiskParam *param = pApi->getGeneralRiskParam(i);
}
```

The general risk control parameters from "YDGeneralRiskParam" are static data, their structure is as follows. The primary keys are (GeneralRiskParamType, AccountRef, ExtendedRef):

Field	Description
GeneralRiskParamType	Type of risk control rules
AccountRef	Account reference No., -1 means effective for all users, and other values mean effective for this user
ExtendedRef	Extended reference No., which can represent the serial numbers of exchanges, products and instruments according to the rule definition
IntValue1	Integer value 1
IntValue2	Integer value 2
FloatValue	Floating-point value

Not all the risk control rules involve all the above "IntValue1", "IntValue2" and "FloatValue". Most of the risk control rules only involve some of the parameters regarding the above rules. Refer to the specific risk control rules for details. Those parameter values not listed in the risk control rules means that they are not used.

3.2.4. Receive Dynamic Data

After the YD OMS has completed the transmission of static data, the OMS port is ready to receive orders. If order submission starts at this time, the OMS will normally push dynamic data such as notifications. However, if the dynamic data is not sent completely to the client during an offline period of the client through the OMS, which means that the client's trading basis at this time may be wrong. In order to notify investors that all historical dynamic data have been received and a normal trading can be started, YD added this stage and notified investors through the callback function "notifyCaughtUp".

```
virtual void notifyCaughtUp(void)
```

The basic principle is that the OMS can show the investor the maximum SN when logging in. The API can be used to compare the SN of the current dynamic data with the maximum trading flow SN when logging in. If the current trading flow SN exceeds the maximum one when logging in, then the catching-up of the trading flow can be considered as completed. The callback of this method only indicates that it has caught up with the flow generated when logging in. In fact, there may be a trading flow generated after logging in. This message can be obtained again after disconnection and then reconnection, refer to Trading Reconnection for details.

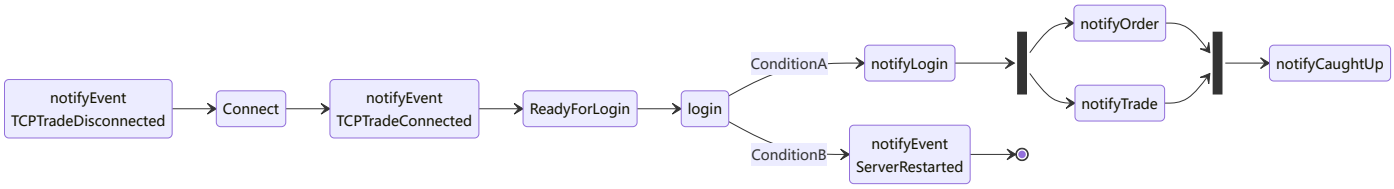
The dynamic data collected during this stage is the same as that collected during normal trading, so the callback functions for collecting dynamic data will not be enumerated here. Refer to the description of callback functions in the corresponding operations.

3.3. Reconnection

3.3.1. Trading reconnection

When detecting that the TCP trading connection with the OMS is interrupted or timed out, the API will call back "notifyEvent" (YD_AE_TCPTradeDisconnected) to notify the trading thread that it has disconnected from the OMS. Then the API will go on to initiate the connection to the OMS until the reconnection is made, and the API will call back a "notifyEvent"(YD_AE_TCPTradeConnected) notification. The subsequent process is similar to that for Start except the following differences:

- The static data will not be retransmitted during reconnection, because no "notifyFinishInit" callback will be made. After logging in, the orders and trading flow generated during disconnection will be transmitted;
- During logging in, it is not allowed to use another username. During calling login, the API can be used to determine whether to go to the next step or terminate the API depending on different factors. Refer to the following for the specific logic;
  - Check the data fingerprint of the OMS for being changed. If changed, enter the termination logic operation (ConditionB) directly. The data fingerprint of the OMS is calculated overall based on the preday data and the configuration information of YD. Uploading incorrect preday data, uploading new trading day data and restarting the OMS, and changing technical parameters such as exchange or seat configured in the OMS and restarting the OMS are common reasons for the data fingerprint change of the OMS.
  - If the data fingerprint of the OMS does not change, the instance ID should be checked. The instance ID varies after the OMS is started each time, so it can be used to check whether the OMS has been restarted. The following three possibilities should be considered when checking whether the OMS is restarted and whether the HA function of the API is enabled;
    - If the OMS is not restarted, it means that the disconnection is caused by a network problem, and the system will go on to conduct the subsequent steps normally (ConditionA);
    - If the OMS is restarted and the HA function of API is enabled, the subsequent steps will be conducted normally (ConditionA). At this time, the notifyEvent (YD_AE_ServerSwitch) callback will be received before notifyLogin, indicating that a main /standby server switching has been conducted.
    - If the HA function of the API is not enabled, it will directly enter the termination logic operation (ConditionB)
  - After entering the termination logic operation, generally, the API will call the "exit()" system call to exit the entire process, which, together with the strategy program, will exit the system. In order to prevent this, the API can be destroyed actively through Destruction under notifyEvent(YD_AE_ServerRestarted) to skip over calling "Exit" by the API.



In summary, when the OMS is restarted within the same trading day, YD API can provide investors with three different levels of disposal methods:

- Restarting the process: This method is the cleanest, simplest and almost error-free in operation. The strategy program can receive trading flows from the OMS from the beginning again and restores to the latest state. The disadvantage is that the strategy program is liable to exit jointly, which may show a relatively low operability in production.
- Re-establishing API instances: This method is relatively clean and will not cause the policy program to exit. After instances are re-established, the API will push all trading flows again. If the strategy program aims to save and reuse the local trading flows, it may need to merge the trading flows retransmitted by the API, and the strategy program should ensure that the access to the destroyed instance data is prevented during the re-establishment, otherwise the program will crash, so the strategy program should be controlled carefully. During the re-establishment of the instances, some unknown timeout orders at the strategy program end and those orders from an external system may need to be handled. Refer to High Availability for details.
- Re-establishing the connection: Namely enabling the connection under the HA mode that has little impact on the strategy program. When an automatic switching is made, just notify the policy program of the HA switching through notifyEvent(YD_AE_ServerSwitch). Considering that the strategy program usually have the ability to handle unknown timeout orders at the strategy end and those order from an external system, this method is the most friendly to the strategy program. Refer to High Availability for details under this mode.

3.3.1.1. High availability

In order to meet the requirements of market makers and investors attaching importance to availability, YD launched an HA cluster function, which can ensure the maximum business continuity. In cases of hardware crashes, program errors and other failures of the OMS, investors' trading can recover within the shortest period of time.

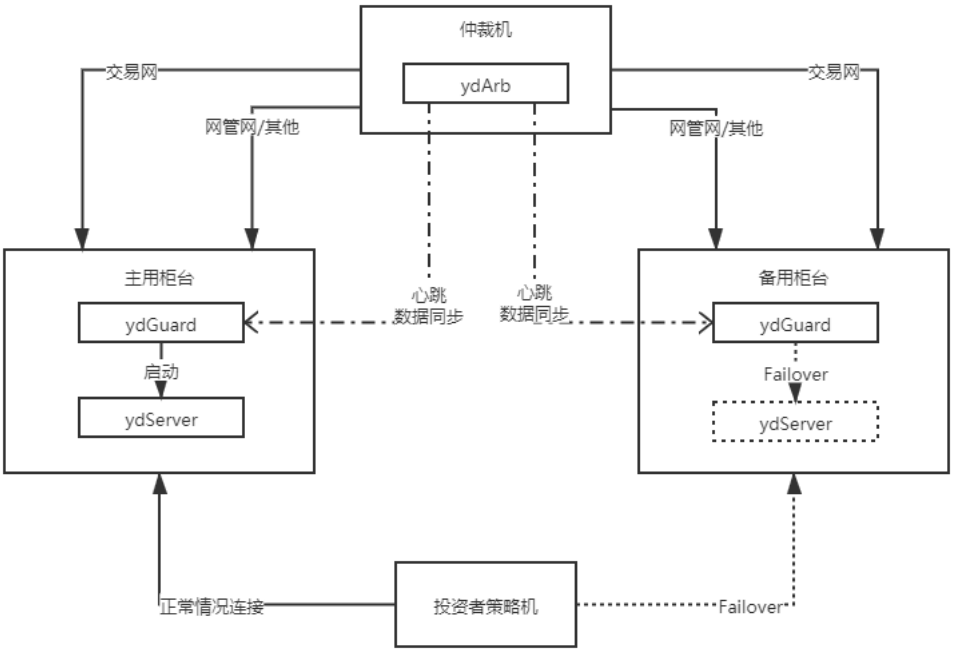
The HA cluster is a hot standby one composed of three servers, including two OMS servers running ydServer and one arbitration server running ydArb. In order to meet the balance between performance and availability of different users, the hardware configuration of the main/standby OMS servers can be subject to different combinations:

- Highest protection: Common main and standby servers are used to ensure that failures of the main server can be prevented as much as possible. Even if a failure occurs, to the utmost extent, the standby server can also be successfully started and used to take over the trading. For the current version, the look-through performance of common servers after performance optimization is 500ns worse than that of the overclocking machines, which is more suitable for market makers, broker-dealers and other users who extremely attach importance to system stability and trading availability.
- Performance maintenance and protection: The main and standby servers are an overclocking machine and a common server, respectively. Considering that current overclocking machines are relatively stable and usually do not fail, most of the orders are handled with overclocking machines relying on their highest performance. Once an overclocking machine fails, since the common server used by the standby machine is extremely stable, the standby server, to the utmost extent, can also be successfully started and used to take over the trading. This method attaches importance on both performance and availability. The performance, though being relatively low, can help to ensure the trading continuity in case of server switching.
- Highest performance: Both the main and standby servers are overclocking machines to ensure the trading performance to the utmost extent. However, since the shelf time and aging time for the main server are the same as those for the standby server, the standby server will not be started sometimes in case of main/standby switching. However, the stability of overclocking machines has been greatly enhanced, so almost no failure can be caused. This configuration combination is suitable for most investors.

An arbitration network should be established for all the three servers in the high-availability (HA) cluster to transmit heartbeat messages, trading flows and start/stop control commands. The arbitration network only needs to ensure the arbiter is connected to main/standby servers, while the connectivity between main/standby servers is not required. Based on about 600MB per connection a day, a general gigabit network can meet the bandwidth requirements of the arbitration network. The network management system can be used as the arbitration network if the capacity of its system meets the bandwidth requirements. It is suggested to configure the investment trading network as a backup for the arbitration network to prevent invalid switching errors due to arbitration network failure. All trading flows are concentrated on the arbitration network when it is running smoothly, while there is no trading flow on the trading network. The trading flows will be switched to the trading network when the arbitration network fails. If the arbiter cannot be connected to the main server via the arbitration network, it will try to contact the main server through the standby network. If the connection fails again, it is more feasible to switch from the main server to the standby one as investors are most likely unable to connect to the OMS at this time.

The main component functions of the HA cluster are as follows:

- ydArb：YdArb: A perpetual arbitration program used for arbiters. The availability of the cluster can be monitored through heartbeat messages. When the main site fails, the standby site will be actively notified to start to replace the main site, and the trading data (trading flows of an exchange and local OMS) will be transmitted continuously from the main site to the standby site to ensure that the standby site can start up as quickly as possible.
- ydGuard: A perpetual daemon of ydServer used for main and standby servers. It is used for detecting the status of ydServer and reporting it to ydArb. The main server can transmit the trading data from ydGuard to ydArb, while the ydGuard of the standby OMS can receive the trading data from ydArb. The ydGuard data transmission of the main server is asynchronous with the trading through the ydServer. It is very likely that a notification has been sent to investors but not synchronized to the standby OMS.



Before connecting to an HA cluster, the API configuration files should be modified according to the following example.

```
RecoverySiteCount=2
TradingServerIP=<ip of master host>
TradingServerPort=<port of master host>
TradingServerIP2=<ip of slave host>
TradingServerPort2=<port of slave host>
```

During normal operation, the ydServer process of the main server is enabled, while the ydServer process of the standby server is stopped. The cluster composed of ydArb and ydGuard continuously transmits the trading flow from the main server to the standby OMS through the arbiter in real time. At this time, the investor's API is connected to the ydServer of the main server for trading.

In case of main/standby server switching, the ydServer of the standby server will be started, and the synchronized trading data will be loaded to recover to the state before the main server fails. After YD API detects a disconnection, it will poll the IP addresses of the main and standby servers until a reconnection has been made. For the details of the subsequent steps after reconnection, refer to Trading Reconnection for more details. Due to the inherent complexity for main /standby server switching, the following problems are inevitable and should be handled by investors:

- Local unknown timeout order: If the OMS fails after an order is sent by the strategy program and before it is sent by the OMS to an exchange. The strategy program will always wait for the notification to update the order status, however, since the order is not submitted to the exchange, for the OMS and the exchange, this order does not exist, and of course it is impossible to cancel this order. Therefore, the strategy program should be established with a timeout mechanism. In case of main/standby sever switching, those local timeout orders at the strategy end should be canceled actively. Please note that the causes and consequences regarding local timeout orders are different from those regarding the Unknown Timeout Order, and accordingly the processing methods are also different.
- Failing in determination of relationship between an order and the corresponding trade: If the OMS fails after an order is sent by the OMS and before the trading flow of the main server is synchronized to the standby one, it is obvious that after the failure, the strategy program has not received the order notification from the corresponding exchange (otherwise, there will be no missed orders for special treatment). After the standby OMS is started, YD will ensure that no order missing will be caused, however, since the local trading flow of the main server has not been synchronized, the order notification re-sent by the standby OMS will contain OrderSysID, OrderLocalID and RealConnectionID except for OrderRef. After receiving this notification, the investor cannot match this order with that recorded by the strategy program end. When OrderRef is -1, the order can be handled according to the common external order submission logic, while if the order fails to match that of the strategy program end, it should be handled according to the local unknown timeout order processing logic.

The single-host HA mode is a special case for the dual-host HA mode, which means making two IP addresses be the same under the dual-host HA mode. Their actual effects are basically the same. The single-host HA mode simplifies the handling process when the strategy program and the OMS are restarted within the same trading day, and therefore investors are suggested to choose the single-host HA mode as much as possible. The configuration example of the corresponding configuration files for the single-host HA mode is as follows:

```
RecoverySiteCount=1
TradingServerIP=<ip of master host>
TradingServerPort=<port of master host>
```

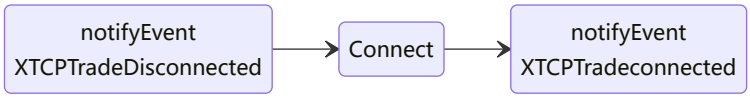
3.3.2. Market data reconnection

When the API detects that the TCP market data connection with the OMS is interrupted or timed out, the API will call back the notifyEvent(YD_AE_TCPMarketDataDisconnected) to notify of the disconnection between the market data thread and the OMS, then the API will continue to initiate the connection to the OMS and call back the notifyEvent(YD_AE_TCPMarketDataConnected) notification after reconnecting. Compared with the process of trading reconnection, market data reconnection is much simpler. After the reconnection, re-subscription to the market data will unnecessary since the API will automatically re-subscribe to the instrument subscribed before the disconnection and continue to collect the TCP market data.

3.3.3. XTCP reconnection

When the API detects that the XTCP trading connection with the OMS is interrupted or timed out, the API will call back the notifyEvent(YD_AE_XTCPTradeDisconnected) to notify of the disconnection between the XTCP thread and the OMS, then the API will continue to initiate the connection to the OMS and call back the notifyEvent(YD_AE_XTCPTradeConnected) notification after reconnecting.

If investors order during reconnection after disconnection, the API will downgrade to choose the normal TCP order submission mode.



3.4. Destruction

The strategy program can be used for actively destroying API instances to avoid memory leakage or API's exiting the process. Since the structure of YD API is relatively complex and cannot be cleaned up by deleting instances, YD provides startDestroy in ydApi for instance cleaning. Please never try to delete API instances directly.

```
virtual void startDestroy(void)
```

The startDestroy initiates a two-stage asynchronous destruction process. The notification regarding this function does not mean a complete cleanup.

- The main task in the first stage is to try to disable all connections and threads regarding API, and then the completion of which can be notified through "YDListener.notifyBeforeApiDestroy". In this process, all trading functions including the callback function of "notifyBeforeApiDestroy" will be disabled for API, and the trading callback function of YDListener will not be recalled. However, all query functions of ydApi and the data managed in ydExtendedApi can still be used.

  ```
  virtual void notifyBeforeApiDestroy(void)
  ```

- The main task of the second stage is to destroy all data. and then the completion of cleaning will be notified through "YDListener.notifyAfterApiDestroy". In this process, all API functions including the callback function of notifyAfterApiDestroy and all pointers obtained from API will be disabled.

  ```
  virtual void notifyAfterApiDestroy(void)
  ```

After cleaning, the YDListener subclass instances implemented and instantiated should be cleaned. This function can help to destroy instances. In the policy program, new API instances can be established.

4. Fund

4.1. Equity

4.1.1. Pre balance

Pre balance, also known as pre-day equity, is mainly composed of pre equity. The pre balance calculation methods of futures exchanges and stock exchanges are different, the following will introduce respectively.

> In order to facilitate brokers to configure and use the YD system and reduce unnecessary configuration errors, YD directly uses the pre-day documents of the existing primary connection system as the pre-day data of YD after conversion, which include pre balance, pre-day position, margin rate, commission rate and some risk control rules, etc. At present, the futures exchange pre-day data of YD can be read directly from CTP syncmerge or CTP heterogeneous data interface, while the stock option pre-day data of stock exchanges is obtained from different data sources. In order to meet the demand and ensure the checking relationship of different data sources, YD has introduced some internal calculation methods. If the primary OMS used by brokers is of other brands, YD will continue to add new pre-day data conversion programs to meet the unrestricted demand of investors to participate in trading in brokers' sub-positions.

Pre balance can be obtained through "YDAccount.PreBalance".

4.1.1.1. Pre balance of futures exchange

The data of futures exchanges is simply calculated after reading from CTP syncmerge or CTP heterogeneous data interface. The calculation formula is as follows: Where, pre equity, pledged amount, currency pledge-in and pledge-out amounts are directly read from the source data, and fixed deduction is set in the YD system.

$$\mathrm{PreBalance} = \mathrm{PreEquity} + \mathrm{Pledged} + \mathrm{CurrencyPledgeIn} - \mathrm{CurrencyPledgeOut} - \mathrm{FixedDeduction}_{YD}$$

At present, in the market, brokers and investors always sign agreements to agree on fixed equities of each secondary OMS. Brokers modify pre-day data for fund splitting. This approach is simple, but the opportunity brought by a market quote of an exchange is always hard to seize due to lack of funds, even if the funds can be allocated through depositing/withdrawing, the complex review of manual operation always cause missing of trading opportunities. Therefore, YD considered this at the beginning of the design. When investors trade through different YD OMSs at the same time, it is suggested that the brokers should not split the investors' pre-equities, so that the pre-equities read on each OMS can be the same, and then the proportions of investors' pre-equities can be controlled through each OMS based on maximum money usage parameters. Under the help of YD's fund transfer manager, when the sum of the maximum money usage of the same investor for all OMSs is less than or equal to 100%, the investor can modify the maximum money usage at its own discretion in order to achieve the effect of real-time fund transfer. For the meaning of maximum money usage, refer to Today Balance for more details.

Fixed deduction refers to a function designed by YD that can allow investors use maximum money usage on the OMS and other secondary OMSs for trading at the same time. As shown in the following table, assuming that an investor has a 1 million-equity, 800,000 is allocated on the OMS, and 200,000, allocated on other secondary OMSs, then after a fixed deduction, the maximum money usage function can still work normally.

Exchange	Type of OMS	Total equity of different OMSs	maximum money usage	Equity proportion
SHFE	YD	80	40%	32
DCE	YD	80	50%	40
CFFEX	YD	80	10%	8
CZCE	Other	20		20

4.1.1.2. Pre balance of stock exchange

Pre-equities of investors in the stock markets of Shanghai and Shenzhen can be directly read by stock exchanges and futures exchanges and then dynamically split based on the fund use proportion, which is a practice recommended by YD. In order to meet the practical and actual needs of investors in current markets, YD also supports splitting based on a proportion of usable funds set at the level of each investor (hereinafter referred to as the split proportion, which is defined in the background and cannot be read on API). This function can be used by calculating data from the three data sources namely cfmmc reported documents (from the monitoring center, only data of the stock markets of Shanghai and Shenzhen are involved), CSDC Shanghai data and CSDC Shenzhen data. The whole calculation process is relatively complex. Although it is hard for YD to guarantee that the usable funds displayed on the OMS after splitting based on the proportions are the same as the results calculated based on the splitting proportion shown on the primary OMS, YD can guarantee that the sum of the pre-equities in the

stock markets of Shanghai and Shenzhen is always equal to the pre equity shown on the primary OMS. Just read the following for the specific calculation method of YD. If you are not interested in it, just skip it directly.

On the exercise delivery date, due to the difference in the checking relationship among cfmmc reported documents (from the monitoring center, only data of the stock markets of Shanghai and Shenzhen are involved), CSDC Shanghai data and CSDC Shenzhen data, the usable funds applicable to the YD system should be calculated first and used as the splitting basis.

$$\begin{aligned}\text{Usable}_{YD} = \text{PreEquity}_{cfmmc} - \text{SSEMargin}_{cfmmc} - \text{SZSEMargin}_{cfmmc} + min(\text{NetExerciseAllocation}_{CSDCSH}, 0) \\ + min(\text{NetExerciseAllocationFund}_{CSDCSZ}, 0)\end{aligned}$$

Then the pre equity of YD system can be obtained by splitting the calculated available fund.

$$\text{SSEPreEquity}_{YD} = \text{SSESplittingProp}_{YD} \times \text{Available}_{YD} + \text{SSEMarg}_{cfmmc} - min(\text{NetExerciseAllocationFund}_{CSDCSH}, 0)$$

$$\text{SZSEPreEquity}_{YD} = \text{SZSESplittingProp}_{YD} \times \text{Available}_{YD} + \text{SZSEMarg}_{cfmmc} - min(\text{NetExerciseAllocationFund}_{CSDCSZ}, 0)$$

After a simple combination of the three formulas, it can be seen that the total of pre-equities in the YD system is equal to that in the document of the monitoring center.

$$\text{pre equity}_{cfmmc} = \text{SSZE pre equity}_{YD} + \text{SZSE pre equity}_{YD}$$

The fixed deduction function, just like that of futures exchanges, is still effective, however, if other secondary OMS systems support proportion-based available fund splitting, the fixed deduction function will be unavailable, so it is almost meaningless in the whole process. Generally, the fixed deduction value is 0.

$$\text{pre balance} = \text{pre equity} - \text{fixed deduction}_{YD}$$

4.1.2. Today Balance

In the design of YD, the static equities refer to the overall equity of the day at the investor's level. The static equities of an investor on any YD OMS are the same, and the deposit / withdrawal amounts are also at the investor's level, that is to say, as long as the investor conducts depositing / withdrawing operation through the primary OMS, the corresponding deposit / withdrawal amounts of this investor can be shown on any YD OMS and the amounts are the same as those shown on the primary OMS. Thus, the concept introduction of maximum money usage can be allowed.

If a broker splits its fund based on a fixed amount or an available fund proportion, the deposit/withdrawal amounts can be expressed as those for single OMS. The static equity only represents the investor's equity of that very day shown on the corresponding OMS, and in this case, the maximum money usage should not be used, namely the maximum money usage should be kept at 100%, otherwise a fund confusion will be caused.

Investors using ydExtendedApi can call "YDExtendedAccount.staticCashBalance()" to obtain static equities.

$$\text{StaticEquity} = \text{PreBalance} + \text{Deposit} - \text{Withdrawal}$$

Regardless of the operation mode, the current balance represents the current investor's equity shown on the corresponding OMS at the very day. If you use the OMS according to the original design of YD, the maximum money usage can be adopted to allow automatic deposit/withdrawal synchronization and investors' independent fund transfer.

Investors using ydExtendedApi can obtain the current balance through "YDExtendedAccount.Balance".

$$\text{TodayBalance} = (\text{StaticEquity} - \text{FrozenWithdrawal}) \times \text{MaxMoneyUsage}$$

4.1.2.1. Maximum Money Usage

YD supports splitting the pre-day equity of different systems by setting maximum money usage. As long as the total money usage of each OMS does not exceed 100%, the margin will not be overdrawn. The max money usage can be obtained from "YDAccount.MaxMoneyUsage".

When brokers do not split the funds and reasonably set the maximum money usage for different YD OMSs, investors can use the automatic depositing/withdrawing and independent transfer functions, see the following example.

For example, an investor trades through three YD systems in CFFEX, DCE and SHFE at the same time. Its static equity is CNY 1 million and the maximum money usage are 50%, 30% and 20%, respectively. For simplicity, the impact of margin is ignored in the example, and those cases such as withdrawal amount and set maximum money usage causing insufficient fund will be intercepted by the system, therefore, the following, by default, do not trigger the limits.

	CFFEX	DCE	SHFE
Initial maximum money usage	50%	30%	20%

	CFFEX	DCE	SHFE
Current balance	50	30	20
Current balance after a deposit of CNY 1 million	100	60	40
Emergency fund transfer required in SHFE and set maximum money usage	10%	20%	70%
Current balance after transfer	20	40	140
Current balance after a withdrawal of CNY 500,000	15	30	105

The fund synchronization system (ydSync) can be used for reading the deposit/withdrawal flow of the CTP risk control system in real time and then synchronize it to all YD OMSs; The fund transfer manager (ydFundManager) can help to allowe the fund transfer of different YD OMSs. Brokers can issue transfer accounts for investors so that they can log in to the fund transfer manager to transfer funds. If necessary, just contact the brokers for installation, however the prerequisite for the above functions is that brokers have not split the fund.

4.1.3. Other equities

In order to finally calculate the fund and market value equities, YD calls the trading-related part of the fund and market value equity formulas as dynamic equity. The dynamic equity is only related to the exchange where the OMS belongs to. The dynamic equities of two OMSs with management connections arranged in the same exchange are the same for the same investor. However, if one of the above two OMSs is configured with an full-non-management connection, it cannot receive the trading data from other OMSs. At this time, only the dynamic equity of the OMS with a management connection is accurate. Of course, if this exchange has only one OMS, its dynamic equity will always be accurate regardless of the used connection. The formula for calculating the dynamic equity of a single OMS is as follows:

$$\mathrm{DynamicEquity} = \mathrm{CloseProfitAndLoss} + \mathrm{FuturePositionProfitAndLoss} + \mathrm{NetPremium} - \mathit{Commission}$$

Under the concept of dynamic equity, the formulas for calculating the fund and market value equities of a single OMS are as follows. Based on the above reasons, the fund and market value equities of a single OMS are also simple and addible:

$$\mathrm{TodayFundEquity} = \mathrm{StaticEquity} \times \mathrm{MaxMoneyUsage} + \mathrm{DynamicEquity}$$

$$\mathrm{PreFundEquity} = \mathrm{PreBalance} \times \mathrm{MaxMoneyUsage}$$

$$\mathrm{TodayMarketValueEquity} = \mathrm{TodayFundEquity} + \mathrm{TodayOptionMarketValue}$$

$$\mathrm{PreMarketValueEquity} = \mathrm{PreFundEquity} + \mathrm{PreOptionMarketValue}$$

The above equities can only be obtained through ydExtendedApi:

- Dynamic equity: Obtained through calling "YDExtendedAccount.dynamicCashBalance()"
- Today fund equity: Obtained through calling "YDExtendedAccount.cashBalance()"
- Pre fund equity: Obtained through calling "YDExtendedAccount.preCashBalance()"
- Today market value equity: Obtained through calling "YDExtendedAccount.marketValue()"
- Pre market value equity: Obtained through calling "YDExtendedAccount.preMarketValue()"

4.2. Usable

$$\begin{aligned}\mathrm{Usable} = \mathrm{TodayBalance} + \mathrm{CloseProfitAndLoss} + \mathit{min}(\mathrm{FuturesPositionProfitAndLoss}, 0) + \mathrm{NetPremium} - \mathrm{Commission} \\ -\mathrm{FuturesMargin} - \mathrm{SellOptionMargin} - \mathrm{OptionExerciseMargin} - \mathrm{NetExerciseFrozen}\end{aligned}$$

Investors using ydExtendedApi can call "YDExtendedAccount.usable()" to obtain usable funds. According to the regulations: the position profit cannot be opened, and the position loss must be deducted. Therefore, YD deducts the position loss when calculating a usable fund.

> "YDExtendedAccount.Available" is similar to a usable fund. It can be seen from the following formula that Available does not include the position loss, so an Available cannot be considered as a usable fund.
>
> $$\begin{aligned}\mathrm{Available} = \mathrm{TodayBalance} + \mathrm{CloseProfitAndLoss} + \mathrm{NetPremium} - \mathrm{Commission} \\ -\mathrm{FuturesMargin} - \mathrm{SellOptionMargin} - \mathrm{OptionExerciseMargin} - \mathrm{NetExerciseFrozen}\end{aligned}$$

Since the time and price settings for API and the OMS refreshing are not exactly the same, it may lead to the situation that the API shows sufficient funds, but the OMS refuses due to insufficient funds. Generally, this happens when the fund utilization rate is high. For confirming an order refused by the OMS due to insufficient funds, just contact the broker to obtain the fund information from the OMS log when the order is rejected. Please note that Available does not mean usable funds, the loss of "PositionProfit" should be deducted.

The latest usable funds and Available can only be displayed after refreshed and calculated according to the latest price. Refer to Fund Refresh Mechanism for the specific refresh method.

4.3. Deposit/withdrawal

When an investor has deposits and withdrawals, he/she can obtain the accumulated deposit amount through "YDAccount.Deposit", as well as obtaine the accumulated withdrawal amount through "YDAccount.Withdraw". "YDAccount.Deposit" and "YDAccount.Withdraw" are monotonically increasing within a trading day. The net deposit and withdrawal of the day can be obtained by "YDAccount.Deposit - YDAccount.Withdraw".

The current frozen withdrawal amount can be obtained through "YDAccount.FrozenWithdraw". The frozen withdrawal amount will continue to accumulate as the broker freezes withdrawals. When the broker retreats the frozen withdrawals, the amount of "YDAccount.FrozenWithdraw" will reduce accordingly, or the broker can also deduct the frozen amount that is the same as the wighdrawal amount when making a formal withdrawal.

When a deposit or withdrawal is frozen, the related investor will be notified through "notifyAccount". Since the investor will also be notified when other fields of "YDAccount" change, he/she should check the above three fields in the program for deposits or withdrawals.

```
1 virtual void notifyAccount(const YDAccount *pAccount)
```

4.4. Premium

The premium of the day can be read through "YDExtendedAccount.CashIn", which should be deducted when the option buyer pays a premium, and a premium will be added when the option seller obtains the premium. The order freezing premium and trade premium should be combined in this field regardless of a freezing premium or a premium.

After option orders are sent out from an OMS, the premium should be increased or decreased through "YDExtendedAccount.CashIn" according to the order premium calculation method. As the orders are gradually and completely traded, or during the cancellation of the orders, the frozen premium resulting from the orders should be gradually reduced to 0. At the same time, the premium should also be increased or decreased accordingly during trading.

4.4.1. Order premium

The calculation formula for option buyers' order premium is:

$$\mathrm{LongOrderPremium} = -\mathrm{OrderPrice} \times \mathrm{InstrumentMultiplier} \times \mathrm{OrderVolume}$$

Where, when the order is a market price one, the upper limit price shall prevail; When the order is a price-limited one/FAK/FOK, the order price shall prevail.

The calculation formula for option sellers' order premium is:

$$\mathrm{ShortOrderPremium} = \mathrm{OrderPrice} \times \mathrm{InstrumentMultiplier} \times \mathrm{OrderVolume}$$

Where, the price is controlled by parameters (Name, Target) namely (SellOrderPremiumBasePrice, Options) in "YDSystemParam". The following shows how to handle different parameters by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price;
- YD_CBT_OrderPrice: When the order is a market price one, the lower limit price shall prevail; When the order is a price-limited one/FAK/FOK, the order price shall prevail;
- YD_CBT_None: No premium will be added, which is equal to the price of 0, namely the option seller will not get the premium when submitting orders. This is a default configuration and popular for mainstream systems.

4.4.2. Trade premium

The calculation formula for option buyers' trade premium is:

$$\mathrm{LongTradePremium} = -\mathrm{TradePrice} \times \mathrm{InstrumentMultiplier} \times \mathrm{TradeVolume}$$

The calculation formula for option sellers' trade premium is:

$$\mathrm{ShortTradePremium} = \mathrm{TradePrice} \times \mathrm{InstrumentMultiplier} \times \mathrm{TradeVolume}$$

4.5. Option market value

$$\begin{aligned}\mathrm{PreOptionMarketValue} = {} & \mathrm{LongOptionPositionVolume} \times \mathrm{PreSettlementPrice} \times \mathrm{InstrumentMultiplier} \\ & -\mathrm{ShortOptionPositionVolume} \times \mathrm{PreSettlementPrice} \times \mathrm{InstrumentMultiplier}\end{aligned}$$

$$\begin{aligned}\mathrm{TodayOptionMarketVal} = {} & \mathrm{LongOptionPositionVolume} \times \mathrm{LatestPrice} \times \mathrm{InstrumentMultiplier} \\ & -\mathrm{ShortOptionPositionVolume} \times \mathrm{LatestPrice} \times \mathrm{InstrumentMultiplier}\end{aligned}$$

The pre-option market value and current option market value can be obtained through "YDExtendedAccount.PrePositionMarketValue" and "YDExtendedAccount.PositionMarketValue", respectively.

The current option market value calculated according to the latest price can only be shown after refresh. Refer to Fund Refresh Mechanism for the specific refresh method.

4.6. Commission

4.6.1. conventional transaction fee

An order handling commission will be charged after orders are handled successfully; An order cancellation commission will be charged after orders are cancelled; A trading commission will be charged after trading. When placing a buy-to-open order for stock options on SSE or SZSE, as well as opening orders for other futures exchanges, the transaction fees are pre-frozen. For market orders, the Upper limit price is used, while for non-market orders, the order price is used. However, transaction fees are not frozen for closing orders.

$$\mathrm{OrderCommission} = \mathrm{OrderCount} \times \mathrm{OrderCommByVolume}$$

$$\mathrm{CancelCommission} = \mathrm{CancelCount} \times \mathrm{OrderActionCommByVolume}$$

$$\mathrm{OpenCommission} = \mathrm{OpenVolume} \times (\mathrm{OpenRatioByMoney} \times \mathrm{OrderPrice} \times \mathrm{InstrumentMultiplier} + \mathrm{OpenRatioByVolume})$$

$$\mathrm{CloseTodayCommission} = \mathrm{CloseTodayVolume} \times (\mathrm{CloseTodayRatioByMoney} \times \mathrm{TradePrice} \times \mathrm{InstrumentMultiplier} + \mathrm{CloseTodayRatioByVolume})$$

$$\mathrm{CloseHistoryCommission} = \mathrm{CloseHistoryVolume} \times (\mathrm{CloseRatioByMoney} \times \mathrm{TradePrice} \times \mathrm{InstrumentMultiplier} + \mathrm{CloseRatioByVolume})$$

$$\mathrm{Commission} = \sum_{AllOrders} OrderCommission + \sum_{AllCancelOrders} CancelCommission + \sum_{AllOpenTrades} OpenCommission + \sum_{AllCloseTodayTrades} CloseTodayCommission + \sum_{AllCloseHistoryTrades} CloseHistoryCommission$$

$$\mathrm{ExerciseCommission} = \mathrm{Exercise\ Quantity} \times (ExerciseRatioByVolume + ExerciseRatioByMoney \times ExercisePrice \times OptionInstrumentMultiplier)$$

The above commissions can be obtained through the "getInstrumentCommissionRate" of ydApi. The function signature is shown below. When querying, the instrument and hedge flag should be specified to uniquely determine a margin rate.

```
virtual const YDCommissionRate *getInstrumentCommissionRate(const YDInstrument *pInstrument,int hedgeFlag,const YDAccount *pAccount=NULL)=0;
```

The corresponding relationships regarding the notified margin rates are shown in the following table:

Parameter	Field	Description
YDCommissionRate	OpenRatioByMoney	Trading commission rate after opening
	OpenRatioByVolume	Commission per trading lot after opening
	CloseRatioByMoney	Trading commission rate for pre position closing
	CloseRatioByVolume	trading commission per pre position closing lot
	CloseTodayRatioByMoney	Trading commission rate for today's position closing
	CloseTodayRatioByVolume	Trading commission per today's position closing lot
	OrderCommByVolume	Commission per orders
	OrderActionCommByVolume	Commission per cancellation
	ExecRatioByMoney	ExerciseRatioByMoney
	ExecRatioByVolume	ExerciseRatioByVolume

The commission calculation methods for position closing in different exchanges are different. YD maintains the pre position volume for commission calculation through "YDExtendedPosition.YDPositionForCommission". Investors can obtain the volume for today's position closing through "YDExtendedPosition.Position-YDExtendedPosition.YDPositionForCommission" for calculating the commission.

In order to determine whether the corresponding instrument supports a today's position closing priority or a pre position closing priority, investors can check whether the corresponding exchange regarding the instrument prefers today's position closing through "YDExchange.CloseTodayFirst".

The following is a brief description of the detailed today's position and pre position sequence each exchange when calculating the commission for position closing:

> Please note that the position details for commission calculation, position closing profit/loss calculation and combined margin calculation are maintained separately, and therefore the position information should be properly selected according to the actual operation.

- For SHFE and INE, dependent on the today's position closing or pre position closing instructions;
- For CFFEX, DCE, GFEX and CZCE, today's position closing is preferred;
- For SSE and SZSE, pre position closing is preferred.

The SSE does not charge any commission for short order selling, which is independent of the set commission parameters.

4.6.2. Message Count Commission

Currently, all products from SHFE and INE, as well as some products from DCE and CZCE, have commenced collecting commissions based on message count. YD supports the collection of message count commission according to the OTR and message count tiers. For specific fee standards, please refer to the relevant notices of each exchange.

In certain circumstances, the message count commission can be waived. For instance, inquiry orders from exchanges other than SHFE and INE are not counted towards the message count, and market makers are not charged an message count commission. Investors can inspect "YDAccountInstrumentInfo.ExemptMessageCommissionYDOrderFlag" and the "YDOrderFlag" of the order to determine whether the order is included in the message count. If "YDOrderFlag > YDAccountInstrumentInfo.ExemptMessageCommissionYDOrderFlag", it is not included; otherwise, it should be included.

To ensure the rationality of the OTR under extreme conditions while aligning with the regulatory formula, YD employs the following calculation formula for the OTR:

$$OTR = \frac{max(\text{message count}, 1)}{max(\text{number of successful orders}, 1)} - 1$$

In the above formula, the definition of a successful order is as follows: if an order is partially or fully filled, then this order is counted as one successful order. Multiple executions from one order are not repeatedly counted.

The method for calculating the message count is as follows:

- Limit order: If it's completely filled, only one order is counted. If it's cancelled, both one order and one cancel are counted.
- FAK/FOK order: If completely filled, only one order is counted. If not filled or not completely filled and a cancel is generated, both one order and one cancel are counted.
- Market order: If completely filled, only one order is counted. If not filled or not completely filled and a cancel is generated, both one order and one cancel are counted.
- Inquiry order: For options inquiry orders from the SHFE and INE, one message count is added. For futures inquiry orders from the SHFE and inquiry orders from other exchanges, they are not counted.
- Combination (Arbitrage) order: message count of each leg of a combination order is separately counted on each leg.
- Exchange forced liquidation orders and non-futures company forced liquidation orders: both are included in the message count.
- Forced reduction orders: are not included in the message count.
- Erroneous orders for limit orders, FAK orders, FOK orders, and market orders: are not included in the message count.
- Erroneous cancel orders for limit orders: are not included in the message count.
- Combination and decomposition instructions, option exercise and waiver, options hedging, hedging after performance, erroneous orders, erroneous cancel: are not included in the message count.
- Market makers are exempted from the message count commission for market-making varieties.

When placing an order, YD will charge commissions according to the worst possible scenario for the order. After receiving the notification, it will deduct the over-calculated message count according to the actual situation of the notification. For example, if the OMS receives a limit order and counts 2 message counts, if the order is rejected, 2 message counts will be deducted. If the order is subsequently cancelled, no message count will be deducted. The message count of inquiry orders can be obtained through "YDAccountInstrumentInfo.RFQCount". Since the inquiry order does not send a report to ordinary investors, when placing an option inquiry order in the SHFE and INE, if the message count commission generated by the inquiry order is not passed, the inquiry order will be directly discarded without notifying the customer. However, this error message will be recorded in the OMS's inputFlow.txt, which is the same as other failed inquiry orders.

The message count commission uses a segmented accumulation calculation method. Please refer to the calculation example in the Message Count Commission Rate. Investors using "ydExtendedApi" can obtain the total message count commission of the account through "YDExtendedAccount.MessageCommission".

Due to improper control of the investor's program, it may cause a large amount of unexpected message count commissions. In order to avoid the significant loss caused by the message count commissions to the investors, please contact the broker to set the Message Count Risk Control.

4.7. Fund refresh mechanism

The YD margin, position profit/loss and position market value are not queried from an OMS but are calculated directly at the client according to the same method as that used on the OMS.

Since '1.98', YD API has provided a variety of mechanisms to automatically refresh the margin rate and position profit/loss during trading, and to some great extents, supported investors using different APIs. By setting the RecalcMode parameter in the API configuration file, three refresh mechanisms of APIs can be specified: Close, Subscribe to Market Data Only and Auto. Three mechanisms are introduced separately in the following.

4.7.1. Close

"Close" means that the automatic refresh mechanism can be completely closed. It is up to investors to decide the refresh time and method.

For investors using ydApi, because no funds and positions are calculated through ydApi, all the refresh work should be completed by investors rather than the API.

For investors using ydExtendedApi, when necessary, they can refresh margins and position profit/loss by calling "recalcMarginAndPositionProfit" and refresh position market value by calling "recalcPositionMarketValue". Both functions are provided without input parameters. Since the "Close" mode does not support automatical subscribing to the market data, TCP market data (ConnectTCPMarketData=yes) collection must be ensured, otherwise the calculation and refresh should be conducted based on the pre-day market data.

4.7.2. Subscribe to Market Data

The "Subscribe to Market Data" mode can help investors automatically subscribe to and refresh the market data in relation to all current traded instruments or position instruments. If an option instrument is automatically subscribed to, its underlying instrument will be included automatically for the sake of accurate calculation of the option margin. However, the automatically subscribed market data will not be directly sent to investors through "notifyMarketData". It can be obtained through "notifyMarketData" if necessary. The subscription should be made separately through "Subscribe". This model is helpful to investors using ydApi and ydExtendedApi.

For investors using ydApi, the "YDMarketData" market data of the API can be refreshed when new market data arrives. Investors can directly read the price of the corresponding instrument for refresh.

For investors using "ydExtendedApi", the market data can be saved in "ydExtendedApi". When necessary, the investors can refresh the margin and position profit/loss by calling "recalcMarginAndPositionProfit", and refresh the position market value by calling "recalcPositionMarketValue". Both functions are provided without input parameters.

4.7.3. Auto Mode

The "Auto" mode covers all functions of the "Subscribe to Market Data" mode, and based on which, further supports for different types of APIs are provided.

For investors using ydApi, in order to help to stagger the possible order handling time, the API can notify them of the safe refresh time detected by the system through "notifyRecalcTime". They can call their own refresh method through this function.

The safe refresh time is calculated based on the last received TCP market data time and the settings of "RecalcMarginPositionProfitGap" and "RecalcFreeGap" of the API configuration file. "RecalcMarginPositionProfitGap" refers to the minimum gap between two consecutive refreshes, which can be set to 1,000 ms. The setting below 1,000 ms should be adjusted to 1,000 ms. "RecalcFreeGap" refers to the safe gap between the safe refresh time and the time before and after the arrival of market data, the setting range of which is 0~100 ms. All settings beyond the range should be adjusted to the nearest valid value.

The specific calculation method is that after the last safe refresh time reaches RecalcMarginPositionProfitGap, assuming that the TCP market data received by API last time is 0 ms, and the 250 ms is a detection period. In this detection period, the start time of the remaining time period after cancelling the RecalcFreeGap ms before and after the detection period should be the safe refresh time. Assuming RecalcFreeGap is 100 ms, the time receiving the market data is 0 ms, the feasible time period is 100 ms~150 ms, the remaining time period is 50 ms and then the safe refresh time should be 100 ms.

Considering that the market data arrives continuously, causing that the safe refresh time is missed continuously, YD has set a protection time, namely if the last refresh time is more than 3 times of the RecalcMarginPositionProfitGap, ydApi will notify the customers to force the refresh through notifyRecalcTime.

For investors using ydExtendedApi, the API will automatically call "recalcMarginAndPositionProfit" and "recalcPositionMarketValue" to refresh at the safe refresh time, so coding is unnecessary. At this time, notifyRecalcTime will be used to notify investors after calling and completing the above two refresh functions, and investors can decide whether to do other work except refresh at this time.

YD has tried its best to help investors stagger those possible order handling time periods, but investors' order submission behavior might exceed YD's expectations. Therefore, if the refresh time under the "Auto" mode clashes with the order submission time, the parameters can be adjusted or the "Subscribe to Market Data" mode can be selected to determine the refresh time.

5. Positions

5.1. Position structure

Different exchanges have different position management methods. Some exchanges strictly make a distinction between today's positions and pre positions and have special instructions for current/pre position closing; Some exchanges do not strictly make a distinction between today's positions and pre positions, nor do they have special instructions for current/pre position closing except for individual operations (such as commission for today's position closing). Therefore, YD has established the corresponding position structures according to the position structures of different exchanges. In order to distinguish the position structures used by current exchanges, investors can check the value of "YDExchange.UseTodayPosition": When this value is "True", it means that the exchange makes a distinction between today's positions and pre positions, and two corresponding position structures will be adopted by the YD system to represent today's positions and pre positions; When the value is "False", it means that the exchange does not make a distinction between today's positions and pre positions, and only one position structure will be adopted by the YD system to represent the corresponding positions.

The position organization mode of YDExtendedApi is basically the same as the internal one of YD OMSs, so the following will take the "YDExtendedPosition" position of YDExtendedApi as an example to introduce the rules and related logic used to calculate the commissions, position closing profit/loss and combined operation through the above two position structures. The fields related to the position structure of YDExtendedPosition are shown below. The primary keys are instrument, position date, position direction and hedge flag.

Field	Description
getInstrument()	Instrument
PositionDate	Position date YD_PSD_History: Pre position YD_PSD_Today: Today's position If the exchange does not make a distinction between today's positions and pre positions, YD_PSD_History should be used to represent them
PositionDirection	Position direction YD_PD_Long: long position YD_PD_Short: short position
HedgeFlag	The definition of hedge flags is different for futures exchanges and stock option exchanges. The definition of hedge flag for futures exchanges is as follows: YD_HF_Speculation=1: Speculation YD_HF_Arbitrage=2: Arbitrage, only supported by CFFEX. In order to facilitate the coding, YD provides a parameterized representation to determine whether to support arbitrage trading and positions. When the value of "YDExchange.UseArbitragePosition" is "True", it means that the exchange supports arbitrage trading and positions, otherwise it does not support YD_HF_Hedge=3: hedge The definition of hedge flag for stock option exchanges is as follows: YD_HF_Normal=1: Normal YD_HF_Covered=3: covered
Position	For the total positions under the current primary keys, if a distinction is made between today's positions and pre positions, it means the today's positions and pre positions of an instrument regarding a direction and a hedge flag, respectively; if no any distinction is made between today's positions and pre positions, it means the total positions of the instrument regarding a position direction and a hedge flag
PositionDetailList	The position chain list used for profit/ loss calculation under the current primary keys is composed of positions that have not been closed according to the trading sequence Position closing always starts one by one from the head of the chain list, namely, according to the principle of Opening-Sequence Based Closing.
YDPositionForCommission	Pre positions used for commission calculation under current primary keys are only valid when no distinction is made between today's positions and pre positions. At this time, the today's positions used for commission calculation is "Position-YDPositionForCommission"

For a position chain list involved in combinations, the traditional combined positions are sequenced according to the combination sequence; For a position chain list not involved in combinations, the single-leg positions are sequenced according to the trading sequence. Due to the frequent changes in the structure of the traditional combined position details, YD did not directly open ports for traditional combined positions and single-leg positions in the above position structures. Refer to the relevant query functions for querying the traditional combined positions. At present, only the exchanges that do not make a distinction between today's positions and pre positions support combination and decombination.

- If an exchange makes a distinction between today's positions and pre positions,
  - The following operations will be performed on the position with PositionDate set to YD_PSD_Today when opening a position.
    - Adding "Position" of the corresponding position to update the total positions
    - Adding the new trade volume after opening to the end of the position chain list for calculating the profit/loss of the above-mentioned positions
  - When closing, investors should specify "YDInputOrder.OffsetFlag" as "YD_OF_CloseToday" or "YD_OF_CloseYesterday", which mean today's position closing or pre position closing, respectively (if set to "YD_OF_Close", it will be automatically converted to "YD_OF_CloseYesterday"), and the following operations will be completed for the affected positions:
    - Deducting the "Position" of today's positions or pre positions to update the volume of today's positions or pre positions
    - Updating the position chain list for profit/loss calculation according to the principle of Opening-Sequence Based Closing.
- When an exchange does not make a distinction between today's positions and pre positions,
  - The following operations will be performed on the position with PositionDate set to YD_PSD_Yesterday when opening a position.
    - Adding "Position" of the corresponding position to update the total positions
    - Adding the new opening transaction to the tail of the position chain list for calculating the profit/loss of the above-mentioned positions
    - If the exchange supports traditional combined position operation, adding the new opening transaction to the tail of the traditional combined position chain list of the above-mentioned positions.
  - When closing, investors should specify YDInputOrder.OffsetFlag as YD_OF_Close, which means position closing (if set to YD_OF_CloseToday or YD_OF_CloseYesterday, it will be automatically converted to YD_OF_Close), and the following operations will be completed for the positions when PositionDate involves YD_PSD_Yesterday:
    - Deducting "Position" of corresponding positions to update the total positions
    - Updating the position chain list for profit/loss calculation according to the principle of "Opening-Sequence Based Closing".
    - If the value of "YDExchange.CloseTodayFirst" is "False", YDPositionForCommission will be deducted first; If the value of "YDExchange.CloseTodayFirst" is "True", only when "the Position closing volume" > "Today's positions used for commission calculation", the part that cannot be covered by today's positions used for commission calculation should be deducted from YDPositionForCommission
    - If the exchange supports automatic decombination of traditional combined positions, the items in the single-leg positions should be matched according to the principle of Opening-Sequence Based Closing until the closing volume is covered; If a complete coverage fails, the items in the traditional combined positions should be matched according to the principle of Opening-Sequence Based Closing until the remaining closing volume is covered, and the traditional combined positions and single-leg positions of the opposite leg in the traditional combined positions involved should be modified
  - When combining, the items that can cover the traditional combination volume from the head of the two-position single-leg positions for traditional combination should be selected and added to the end of the two-position combinations; When decombining, the items that can cover the decombination volume from the combined position chain list with two-position combinations should be selected and inserted into the appropriate points of the two-position single-leg positions, namely, the items for keeping the single-leg positions should be sequenced according to the trading sequence.

5.1.1. Extended Position Fields

In addition to the aforementioned fields related to the position structure, YDExtendedPosition also provides the following extended position fields.

Field	Description
getYDPosition()	Pre-position volume. Pre-position volume calculated according to the principle of Opening-Sequence Based Closing.
PositionByOrder	Order position volume. The position volume calculated based on the executed quantity in the order report.Available Closing Quantity can be $min(Position, PositionByOrder) - CloseFrozen$
PossibleOpenVolume	Potential Position Opening Quantity. The sum of the order quantity for outstanding opening orders corresponding to the position. After the orders are completed (fully filled, canceled, or rejected), the potential opening quantity will be reduced by the unfilled quantity in the orders.
OpenFrozen	Frozen Opening Quantity. The sum of the unfilled quantity from outstanding opening orders corresponding to the position. After the order is completed (fully filled, canceled, or rejected), the frozen opening quantity of that order becomes zero.

Field	Description
CloseFrozen	Frozen Closing Quantity, the position that is frozen for closing cannot be liquidated or applied for exercise or abandonment.The sum of the unfilled quantity from outstanding closing orders corresponding to the position, exercise freeze quantity, abandonment freeze quantity, and the traditional portfolio position of stock options in Shanghai and Shenzhen. After the order is completed (fully filled, canceled, rejected, or position unwound), the closing freeze quantity of that order becomes zero.
ExecFrozen	Frozen Exercise Quantity. The sum of the application quantity for exercising options corresponding to the position.
AbandonExecFrozen	Frozen Abandonment Quantity. The sum of the application quantity for abandoning the right to exercise options corresponding to the position.
TotalCombPositions	Position Quantity in the Portfolio.
CombPositionCount	The number of records detailing the position quantity involved in the traditional portfolio.
TotalOpenPrice	Aggregate Opening Cost. The sum of the opening costs from the trade details corresponding to the position. $\text{Opening Cost} = \text{Opening Price} \times \text{open position volume}$。When closing, subtract the opening cost from the corresponding trade details.
getOpenPrice()	Average Opening Price. $\text{Average Opening Price} = \text{Aggregate Opening Cost} \times \text{Open Position Quantity}$
PositionProfit	Futures Position Profit/Loss. For more details, please refer to Profit/Loss on Futures Positions。
CloseProfit	Daily Mark-to-Market Contract's Closing Profit/Loss. In DCE's RULE margin system, options contracts are considered as daily mark-to-market contracts. The profit/loss from closing options positions is calculated in this field. In other cases, the profit/loss from closing options positions is calculated in the non-daily mark-to-market closing profit/loss. For more details, please refer to Closing Profit/Loss。
OtherCloseProfit	Closing Profit/Loss of Non-Daily Mark-to-Market Instruments. For more details, please refer to Closing Profit/Loss。
Margin	The margin calculated based on the set price is always zero after the new portfolio margin business is enabled. For reference on the set price, please consult YDSystemParam。
MarginPerLot	The margin per lot calculated based on the previous settlement price.

5.2. Position query

This section mainly introduces the method for querying real-time positions through ydExtendedApi. All queries are made based on the local data of ydExtendedApi and will not be conducted at the OMSs. Since all query operations are locked, there will be a certain loss in performance. All query methods must be called after notifyCaughtUp, otherwise the position data will be inaccurate due to incomplete order trading data. To query preday-positions, see Preday-Position and traditional-combined-preday-position.

5.2.1. Futures and options position query

A single futures and options position can be queried by calling "getExtendedPosition". For the notified YDExtendedPosition structure, please refer to Position Structure.

```
virtual const YDExtendedPosition *getExtendedPosition(int positionDate,int positionDirection,int hedgeFlag,
    const YDInstrument *pInstrument,const YDAccount *pAccount=NULL,bool create=false)=0;
```

The parameters for calling the above method are as follows:

Parameter	Description
positionDate	Date of position to be queried YD_PSD_History: Pre position YD_PSD_Today: Today's position If the exchange does not make a distinction between today's positions and pre positions, the YD_PSD_History should be used
positionDirection	Position direction to be queried YD_PD_Long: Long position YD_PD_Short: Short position

Parameter	Description
hedgeFlag	Position hedge flag to be queried, the definition of hedge flags is different for futures exchanges and stock option exchanges. The definition of hedge flag for futures exchanges is as follows: YD_HF_Speculation=1: Speculation YD_HF_Arbitrage=2: Arbitrage, only supported by CFFEX. In order to facilitate the coding, YD provides a parameterized representation to determine whether to support arbitrage trading and positions. When the value of YDExchange.UseArbitragePosition is "True", it means that the exchange supports arbitrage trading and positions, otherwise it does not support. YD_HF_Hedge=3: hedge The definition of hedge flag for stock option exchanges is as follows: YD_HF_Normal=1: Normal YD_HF_Covered=3: covered
pInstrument	Instrument pointer to be queried
pAccount	When NULL is filled in, it means that the current API login account is used
create	For determining whether to create an empty position when no position is found. If "True", when no position is found, a newly initialized position of 0 will be sent back. If "False", a NULL will be sent back when no position is found

YD provides the above two different methods for multi-position query, which have the same query parameters:

```
/// positions must have spaces of count, return real number of positions(may be greater than count). Only partial will be set if no enough space
virtual unsigned findExtendedPositions(const YDExtendedPositionFilter *pFilter,unsigned count,const YDExtendedPosition *positions[])=0;

/// User should call destroy method of return object to free memory after using following method
virtual YDQueryResult<YDExtendedPosition> *findExtendedPositions(const YDExtendedPositionFilter *pFilter)=0;
```

The pseudo-code logic for determining whether a position meets the query criteria is as follows:

```
if YDExtendedPositionFilter.PositionDate>=0 and YDExtendedPosition.PositionDate!=YDExtendedPositionFilter.PositionDate:
  return false;

if YDExtendedPositionFilter.PositionDirection>=0 and YDExtendedPosition.PositionDirection!=YDExtendedPositionFilter.PositionDirection:
  return false;

if YDExtendedPositionFilter.HedgeFlag>=0 and YDExtendedPosition.HedgeFlag!=YDExtendedPositionFilter.HedgeFlag:
  return false;

if YDExtendedPositionFilter.pInstrument!=NULL and YDExtendedPosition.Instrument!=YDExtendedPositionFilter.pInstrument:
  return false;

if YDExtendedPositionFilter.pProduct!=NULL and YDExtendedPosition.Product!=YDExtendedPositionFilter.pProduct:
  return false;

if YDExtendedPositionFilter.pExchange!=NULL and YDExtendedPosition.Exchange!=YDExtendedPositionFilter.pExchange:
  return false;

return true;
```

The description of each field of the parameter YDExtendedPositionFilter is as follows:

Field	Description

Field	Description
PositionDate	Date of position to be queried, when set to 0, it means that this parameter is invalid. YD_PSD_History: pre position YD_PSD_Today: today's position
PositionDirection	Position direction to be queried, when set to 0, it means that this parameter is invalid YD_PD_Long: Long position YD_PD_Short: Short position
HedgeFlag	Position hedge flag to be queried, the definition of hedge flags is different for futures exchanges and stock option exchanges. When set to 0, it means that this parameter is invalid The definition of hedge flag for futures exchanges is as follows: YD_HF_Speculation=1: Speculation YD_HF_Arbitrage=2: Arbitrage, only supported by CFFEX. In order to facilitate the coding, YD provides a parameterized representation to determine whether to support arbitrage trading and positions. When the value of "YDExchange.UseArbitragePosition" is "True", it means that the exchange supports arbitrage trading and positions, otherwise it does not support. YD_HF_Hedge=3: hedge The definition of hedge flag for stock option exchanges is as follows: YD_HF_Normal=1: Normal YD_HF_Covered=3: covered
pInstrument	Instrument pointer, when set to NULL, it means that no limit will be made
pProduct	Product pointer, when set to NULL, it means that no limit will be made
pExchange	Exchange pointer, when set to NULL, it means that no limit will be made
pAccount	The "Investor" should always be set to NULL

The first method requires investors to allocate a fixed-length "YDExtendedPosition" pointer array in advance. If the pre-allocated length is not enough for the space, only the positions with the pre-allocated array length can be filled. Whether the pre-allocated length is enough or not for the space, the return values regarding this method are the total positions meeting the query criteria. Investors, relying on this, can call "findExtendedPositions(pFilter, 0, NULL)" to quickly obtain the total positions meeting the criteria.

- The advantage of this method is that when there are not many positions and the length of the pre-allocated array is enough, the pre-allocated pointer array can be reused without allocating for each query;
- The disadvantage of this method is that if there are many positions, it may need to be called twice (the first time aims to obtain the total positions, the second time, to allocate the array that can include all positions before calling again) to fully obtain all positions meeting the criteria.

The second method can help investors allocate a space for all positions meeting the criteria. However, the allocated space, after being used, should be destroyed actively by calling "YDQueryResult.destory()" since it is not suitable for being deleted by "Delete". Compared with the first method:

- The advantage of this method is that all positions can be notified by one call
- The disadvantage of this method is that the investors need to actively release the space allocated according to this method, and each call will lead to the allocation of a new space, however, frequent allocation and release are very unfriendly to the cache.

5.2.2. Spot position query

The function of "getExtendedSpotPosition" can be called for obtaining single spot positions. At present, it is only used for querying the underlying instrument ETF positions of stock options. The queried result may be incorrect. Please refer to Synchronized Spot Position.

```
virtual const YDExtendedSpotPosition *getExtendedSpotPosition(const YDInstrument *pInstrument,const YDAccount *pAccount=NULL,bool create=false)
```

The parameters for calling the above method are described as follows:

Parameter	Description
pInstrument	Instrument pointer to be queried

Parameter	Description
pAccount	When NULL is filled in, it means that the current API login account is used
create	For determining whether to create an empty position when no position is found. If "True", when no position is found, a newly initialized position of 0 will be sent back. If "False", a NULL will be sent back when no position is found

The notified YDExtendedSpotPosition structure is as follows:

Field	Description
Position	Total positions
ExchangeFrozenVolume	Frozen position volume for covered calls
CoveredVolume	Covered call volume
ExecVolume	Locked put option exercise volume on Day E
ExecAllocatedVolume	Exercise allocated volume on Day E+1, which does not change during trading on Day E+1
ExecAllocatedAmount	Exercise allocated amount on Day E+1, which does not change during trading on Day E+1. Please refer to Preday Position for the calculation method.

YD provides a method for multi-position query. The method can help investors allocate a space for all positions meeting the criteria. However, the allocated space, after being used, should be destroyed actively by calling "YDQueryResult.destory()".

```
/// User should call destroy method of return object to free memory after using following method
virtual YDQueryResult<YDExtendedSpotPosition> *findExtendedSpotPositions(const YDExtendedSpotPositionFilter *pFilter)
```

The pseudo-code logic for determining whether a position meets the query criteria is as follows:

```
if YDExtendedSpotPositionFilter.pInstrument!=NULL and YDExtendedSpotPosition.Instrument!=YDExtendedSpotPositionFilter.pInstrument:
  return false;

if YDExtendedSpotPositionFilter.pProduct!=NULL and YDExtendedSpotPosition.Product!=YDExtendedSpotPositionFilter.pProduct:
  return false;

if YDExtendedSpotPositionFilter.pExchange!=NULL and YDExtendedSpotPosition.Exchange!=YDExtendedSpotPositionFilter.pExchange:
  return false;

return true;
```

Each field of the parameter "YDExtendedSpotPositionFilter" to be filled out is described as follows:

Field	Description
pInstrument	Instrument pointer, valid for non-YD_YOF_CombPosition orders. When set to NULL, it means that no limit will be made
pProduct	Product pointer, valid for non-YD_YOF_CombPosition orders. When set to NULL, it means that no limit will be made
pExchange	Exchange pointer. When set to NULL, it means that no limit will be made
pAccount	The "Investor" should always be set to NULL

5.2.2.1. Synchronized spot position

At present, YD does not have any spot OMS and cannot connect to exchanges to query spot positions, so only preday positions are provided during trading. Because the approximate rate of spot positions is not accurate at this time, the spot volume for locked positions, covered positions, and put option exercise will not be checked by the OMS, which will cause the following problems:

- If the actual lockable positions are insufficient for position locking, the exchange will notify a locking error;

- If the actual available spot positions are insufficient for covered calls, the exchange will return an opening error;
- If the actual available spot positions are insufficient for put option exercise, **the exchange will not check the spot positions and will accept the exercise instruction**, which will cause investors to mistakenly consider the spot positions as sufficient. But in fact, the exercise instruction will fail when a settlement is made, causing losses to investors.

In order to control risks and obtain accurate spot positions, YD provides a spot OMS connector, which will regularly query the spot positions from the spot OMS (currently only CTP is supported) and synchronize them to the stock option OMS. If the broker has enabled the spot OMS connector, the API will notify users of the activated spot position synchronization through the following callback function. The notification message is sent continuously. If no notification is received within 30 s, it means that the synchronization mechanism is interrupted. Just contact the broker in time for troubleshooting.

```
virtual void notifySpotAlive(const YDExchange *pExchange)
```

Under the synchronous activation, if the positions of the spot OMS change, ydApi and ydExtendedApi will be notified through the following callback. The newPosition is the updated spot positions:

```
virtual void notifySpotPosition(const YDInstrument *pInstrument,const YDAccount *pAccount,int newPosition)
```

If an investor uses the YDExtendedListener, the notifyExtendedSpotPosition will be called back when any notifySpotPosition is called back:

```
virtual void notifyExtendedSpotPosition(const YDExtendedSpotPosition *pSpotPosition)
```

5.2.3. Traditional combined position query

YD does not provide a method to query traditional portfolio positions, so investors need to manually maintain them based on Traditional combined preday position

5.2.4. Traditional combined position details query

YD provides the following method for querying the combined position details of SSE and SZSE. The "combPositionDetailID" is the only primary key for determining combined details:

```
/// getCombPositionDetail can only be used in SSE/SZSE
virtual const YDExtendedCombPositionDetail *getCombPositionDetail(int combPositionDetailID)=0;
```

The fields of the notified "YDExtendedCombPositionDetail" structure are as follows:

Field	Description
m_pAccount	Pointer of investors' traditional combined position details
m_pCombPositionDef	Pointer of traditional combined position definition
Position	Detailed traditional combined positions
CombPositionDetailID	Traditional combined position details ID, valid only in SSE and SZSE

YD provides the above two different methods for multi-query of traditional combined position details, which have the same query parameters:

```
/// combPositionDetails must have spaces of count, return real number of combPositionDetails(may be greater than count). Only partial will be set if no enough space
virtual unsigned findCombPositionDetails(const YDCombPositionDetailFilter *pFilter,unsigned count,const YDExtendedCombPositionDetail *combPositionDetails[])=0;

/// User should call destroy method of return object to free memory after using following method
virtual YDQueryResult<YDExtendedCombPositionDetail> *findCombPositionDetails(const YDCombPositionDetailFilter *pFilter)=0;
```

The pseudo-code logic for determining whether traditional combined position details meet the query criteria is as follows. For the sake of easy reading, YDExtendedCombPositionDetail is abbreviated as Detail, and YDCombPositionDetailFilter is abbreviated as Filter:

```
if Filter.IncludeSplit==false and Detail.Position<=0:
  return false
```

```

if Filter.pAccount!=NULL and Detail.m_pAccount!=Filter.pAccount:
  return false

if Filter.pCombPositionDef!=NULL and Detail.m_pCombPositionDef!=Filter.pCombPositionDef:
  return false

if Filter.pInstrument!=NULL:
  hasMatchLeg=false
  for (int legID=0;legID<2;legID++):
    if matchLeg(Detail->m_pCombPositionDef,legID,Filter):
      hasMatchLeg=true
      break
  if hasMatchLeg==false:
    return false

return true

bool matchLeg(YDCombPositionDef Def,int legID,YDCombPositionDetailFilter Filter):
  if Def.m_pInstrument[legID]!=Filter.pInstrument:
    return false

  if Filter.PositionDirection!=0 and Filter.PositionDirection!=Def.PositionDirection[legID]:
    return false

  return true
```

Each field of the parameter YDExtendedPositionFilter to be filled out is described as follows:

Field	Description
pCombPositionDef	Pointer of traditional combined position definition. When set to NULL, it means that no limit will be made.
pInstrument	Pointer of instrument. When set to NULL, it means that no limit will be made.
PositionDirection	Position direction of traditional combined position details to be queried, when set to 0, it means that this parameter is invalid. YD_PD_Long: Long position YD_PD_Short: Short position
IncludeSplit	For determining whether to include traditional combined position details that have been decombined.

The first method requires investors to allocate a fixed-length "YDExtendedCombPositionDetail" pointer array in advance. If the pre-allocated length is not enough for the space, only the traditional combined position details with the pre-allocated array length can be filled. Whether the pre-allocated length is enough or not for the space, the return values regarding this method are the total traditional combined position details meeting the query criteria. Investors, relying on this, can call "findCombPositionDetails(pFilter, 0, NULL)" to quickly obtain the total traditional combined position details meeting the criteria.

- The advantage of this method is that when there are not many traditional combined position details and the length of the pre-allocated array is enough, the pre-allocated pointer array can be reused without allocating for each query;
- The disadvantage of this method is that if there are many traditional combined position details, it may need to be called twice (the first time aims to obtain the total traditional combined position details, the second time, to allocate the array that can include all traditional combined position details before calling again) to fully obtain all traditional combined position details meeting the criteria.

The second method can help investors allocate a space for all traditional combined position details meeting the criteria. However, the allocated space, after being used, should be destroyed actively by calling "YDQueryResult.destory()" since it is not suitable for being deleted by "Delete". Compared with the first method:

- The advantage of this method is that all traditional combined position details can be notified by one call
- The disadvantage of this method is that the investors need to actively release the space allocated according to this method, and each call will lead to the allocation of a new space, however, frequent allocation and release are very unfriendly to the cache.

5.3. Profit / loss of futures positions

$$\text{Profit / loss of long futures positions} = ((\text{latest price} - \text{open price}) \times \text{today's position volume} + (\text{latest price} - \text{pre settlement price}) \times \text{pre position volume}) \times \text{instrument multiplier}$$

$$\text{Profit / loss of short futures positions} = ((\text{open price} - \text{latest price}) \times \text{today's position volume} + (\text{pre settlement price} - \text{latest price}) \times \text{pre position volume}) \times \text{instrument multiplier}$$

For the refresh logic of position profit / loss, see Fund Refresh Mechanism.

5.4. Close Profit/loss of futures

$$\text{Profit/loss of long futures after today's position closing} = (\text{close price–open price}) \times \text{instrument multiplier} \times \text{close position lots}$$

$$\text{Profit/loss of long futures after pre position closing} = (\text{close price–pre settlement}) \times \text{instrument multiplier} \times \text{close position lots}$$

$$\text{Profit/loss of short futures after today's position closing} = (\text{open price–close price}) \times \text{instrument multiplier} \times \text{close position lots}$$

$$\text{Profit/loss of short futures after pre position closing} = (\text{pre settlement} - \text{close price}) \times \text{instrument multiplier} \times \text{close position lots}$$

For the logic of close pair position details, refer to Position Structure.

6. Margin Model

Starting from 2023, various exchanges have already or are about to introduce new portfolio margin models. In order to differentiate, YD refers to the previous margin model as the traditional margin model. After analyzing the solutions provided by various exchanges, it has been determined that for a considerable period of time, both the traditional margin and portfolio margin will coexist. This means that for the same investor, there may be some products that use the traditional margin model while others use the portfolio margin model. As a result, YD has established the concept of margin models and applies them at the investor and product level. This means that products using the same margin model can participate together in margin benefits such as hedging and portfolio optimization.

Currently, YD supports the following margin models:

- YD_MM_Normal=0：Traditional Margin Model
- YD_MM_SPBM=1：CZCE SPBM Portfolio Margin Model
- YD_MM_RULE=2：DCE RULE Portfolio Margin Model

For investors using the ydApi, YD does not provide a method to determine which trading model a specific product or instrument belongs to. Investors need to parse this information from the Combination margin parameters. For investors using the ydExtendedApi, the following method can be used to obtain the margin model to which a specific instrument or product belongs.

```
virtual int getMarginModel(const YDInstrument *pInstrument,const YDAccount *pAccount=NULL)
virtual int getMarginModel(const YDProduct *pProduct,const YDAccount *pAccount=NULL)
```

6.1. Traditional Margin Model

The margin collection and deduction principle of YD Futures Exchange is to **keep consistent with that of the mainstream primary OMS** as much as possible. It should be noted that YD and the mainstream primary OMS can help to calculate the large-side margin together with the pending orders and positions of SSE, INE and CFFEX, however at present, the following two points are inconsistent with those of the mainstream primary OMS in terms of business rules:

- For the combined option margin of DCE, the calculation methods of YD and mainstream primary OMS are different;
- For locked orders of CZCE, considering the positions and pending orders, YD deducts the margin according to the large-side margin calculation method. At present, for the mainstream primary OMS, only the large-side margin deduction of positions rather than that of pending orders can be calculated.

Therefore, except for the above two business cases, the margin authorization of YD and the mainstream primary OMS should be completely consistent when exchanges are closed, however, it may vary slightly during trading considering different notification sequences, market data update time and OMS recalcualtion time.

YD does not make a distinction between the frozen order margin and the position margin but considers it as a margin as a whole. A large-side margin is also calculated according to the sum of the order margin and position margin. For the sake of investors' easy understanding, this text makes a distinction between the order margin and position margin though they are not distincted by OMSs.

6.1.1. Margin rate

To calculate the position margin, the margin rate of the instrument with regard to the corresponding hedge flag should be obtained first. It is suggested that investors directly use "getInstrumentMarginRate" to obtain the corresponding margin rate instead of reading it directly from "YDAccountInstrumentInfo".

```
virtual const YDMarginRate *getInstrumentMarginRate(const YDInstrument *pInstrument,int hedgeFlag,const
YDAccount *pAccount=NULL)
```

The notified YDMarginRate structure has a large number of "union" fields for adapting to different margin models. For the sake of easy understanding, margin rate parameters under three different margin models are listed below.

The following fields are applicable to futures margins of futures exchanges.

Field	Description
m_pAccount	Pointer of investors' margin rate
m_pProduct	Product margin rate pointer
m_pInstrument	Pointer of instrument corresponding to margin rate

Field	Description
HedgeFlag	YD_HF_Speculation=1: Speculation YD_HF_Arbitrage=2: Arbitrage, only supported by CFFEX. In order to facilitate the coding, YD provides a parameterized representation to determine whether to support arbitrage trading and positions. When the value of "YDExchange.UseArbitragePosition" is "True", it means that the exchange supports arbitrage trading and positions, otherwise it does not support. YD_HF_Hedge=3: hedge
LongMarginRatioByMoney	Long margin rate based on amount
LongMarginRatioByVolume	Long margin rate based on lots
ShortMarginRatioByMoney	Short margin rate based on amount
ShortMarginRatioByVolume	Short margin rate based on lots

The following fields are applicable to the commodity option margins of futures exchanges and the stock index option margin of CFFEX.

Field	Description
m_pAccount	Pointer of investors' margin rate
m_pProduct	Product margin rate pointer
m_pInstrument	Pointer of instrument corresponding to margin rate
HedgeFlag	YD_HF_Speculation=1: Speculation YD_HF_Arbitrage=2: Arbitrage, only supported by CFFEX. In order to facilitate the coding, YD provides a parameterized representation to determine whether to support arbitrage trading and positions. When the value of YDExchange.UseArbitragePosition is "True", it means that the exchange supports arbitrage trading and positions, otherwise it does not support. YD_HF_Hedge=3: hedge
CallMarginRatioByMoney	Short margin rate of call option based on amount
CallMarginRatioByVolume	Short margin rate of call option based on lots
PutMarginRatioByMoney	Short margin rate of put option based on amount
PutMarginRatioByVolume	Short margin rate of put option based on lots

The following fields are applicable to the stock option margins of SSE and SZSE.

Field	Description
m_pAccount	Pointer of investors' margin rate
m_pProduct	Product margin rate pointer
m_pInstrument	Pointer of instrument corresponding to margin rate
HedgeFlag	YD_HF_Normal=1: Normal YD_HF_Covered=3: Covered
BaseMarginRate	Margin rate of base instrument
LinearFactor	Linear factor
LowerBoundaryCoef	Minimum boundary coefficient

6.1.1.1. Margin adjustment during trading

Generally, the margin rate is fixed during trading, however, in some cases brokers may adjust the margin for some customers during trading. When a broker updates the margin rate, investors will receive the following callbacks:

```
virtual void notifyUpdateMarginRate(const YDUpdateMarginRate *pUpdateMarginRate)
```

When the margin rate changes, it is unnecessary for investors using ydExtendedApi to worry about which instruments have changed and which position margins need to be updated. ydExtendedApi can be used to properly manage the relevant change of the margin rate, however investors using ydApi should independently update the corresponding instrument position margins with the change of the margin rate. The following table shows the instrument filter fields of updated margin rate "YDUpdateMarginRate" affecting the margin rate. The margin rate related fields are not listed. See the margin rate descriptions corresponding to each margin model mentioned above for details if necessary.

Field	Description
AccountRef	Accont reference No.
ProductRef	Product reference No.
InstrumentRef	Instrument reference No.
HedgeFlagSet	Hedge flag set. If a hedge flag is affected, the bit corresponding to "1<<HedgeFlag will be set"
OptionTypeSet	Option type set. If an option type is affected, the bit corresponding to "1<<OptionsType will be set"
ExpireDate	Instrument expiry date, mainly used for representing the option series
UnderlyingInstrumentRef	Underlying instrument reference No
Multiple	Instrument multiplier, the margin rate of stock options may be adjusted due to the affection of dividend

The following shows the example code for determining whether a change of a received margin rate will affect the positions (instrument and hedge flag):

```
bool applyToInstrument(const CYDUpdateMarginRate *pUpdateMarginRate,const YDInstrument *pInstrument, int hedgeFlag) const
{
  if ((pUpdateMarginRate->ProductRef>=0) && (pInstrument->ProductRef!=pUpdateMarginRate->ProductRef))
  {
    return false;
  }
  if ((pUpdateMarginRate->InstrumentRef>=0) && (pInstrument->InstrumentRef!=pUpdateMarginRate->InstrumentRef))
  {
    return false;
  }
  if ((pUpdateMarginRate->UnderlyingInstrumentRef>=0) && (pInstrument->UnderlyingInstrumentRef!=pUpdateMarginRate->UnderlyingInstrumentRef))
  {
    return false;
  }
  if ((pUpdateMarginRate->ExpireDate>0) && (pInstrument->ExpireDate!=pUpdateMarginRate->ExpireDate))
  {
    return false;
  }
  if ((pUpdateMarginRate->Multiple>0) && (pInstrument->Multiple!=pUpdateMarginRate->Multiple))
  {
    return false;
  }
  if ((pUpdateMarginRate->OptionTypeSet>0) && (((1<<pInstrument->OptionsType)&pUpdateMarginRate->OptionTypeSet)==0))
  {
    return false;
  }
  if ((pUpdateMarginRate->HedgeFlagSet>0) && (((1<<hedgeFlag)&pUpdateMarginRate->HedgeFlagSet)==0))
  {
    return false;
  }
  return true;
}
```

It is suggested that users of ydApi traverse positions to refresh the margin of each position. The pseudo-code is as follows: :

```
virtual void notifyUpdateMarginRate(const YDUpdateMarginRate *pUpdateMarginRate)
{
  for(auto pPosition : AllPositions)
  {
    if (applyToInstrument(pUpdateMarginRate, pPosition->pInstrument, pPosition->hedgeFlag))
    {
      // Using the investor's own margin refresh method
      userDefinedUpdateMargin(pPosition, pUpdateMarginRate);
    }
  }
}
```

6.1.2. Futures margin

The calculation formula for long futures position margin is:

$$\text{Long futures position margin} = (price \times \text{instrument multiplier} \times \text{long position margin rate based on amount} + \text{long position margin rate based on lots}) \times quantity$$

The calculation formula for short futures position margin is:

$$\text{Short futures position margin} = (price \times \text{instrument multiplier} \times \text{short position margin rate based on amount} + \text{short position margin rate based on lots}) \times quantity$$

For **orders**, the order volume is used for calculating the futures order margin. The price is controlled when the parameter value (Name, Target) of YDSystemParam is (OrderMarginBasePrice, Futures). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price
- YD_CBT_OrderPrice: When the order is a market price one, the upper limit price shall prevail; When the order is a price-limited one/FAK/FOK, the order price shall prevail. It is a default configuration mode and the current mode used by the mainstream OMS
- YD_CBT_SamePrice: The same price used as that for the margin rate of futures positions, namely the parameter value obtained when (Name, Target) of YDSystemParam is (MarginBasePrice, Futures) is used. When the used margin rate of futures positions is subject to YD_CBT_OpenPrice at this time, the price used for futures order margin will be a pre settlement one

For **pre positions**, the position volume is used for calculating the futures position margin, and the pre settlement price is always used. The pre positions here refer to the remaining positions after settlements made based on the mark-to-market rules, rather than the concept of today's position / pre position of Position Structure.

For **today's positions**, the position volume is used for calculating the futures position margin. The price is controlled when the parameter value (Name, Target) of YDSystemParam is (MarginBasePrice, Futures). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price
- YD_CBT_OpenPrice: Open price, The margins corresponding to the position details is calculated one by one according to the open price. It is a default configuration mode and the current mode used by the mainstream OMS
- YD_CBT_LastPrice: Latest price
- YD_CBT_MarketAveragePrice: Average market price
- YD_CBT_MaxLastPreSettlementPrice: The higher one between the latest price and pre settlement price. When the trading volume of the instrument is zero for the day, the previous settlement price is used.

6.1.3. Option margin

6.1.3.1. Commodity option margin

For commodity options traded in SHFE, INE, DCE, GFEX and CZCE.

The margin calculation formulas for call commodity options are:

$$\text{Margin of call commodity options} = [\text{Option price} \times \text{option instrument multiplier} + max(\text{base margin of call options} - \text{out-of-the-money (OTM) of call options}/2, \text{base margin of call options}/2)] \times quantity$$

$$\text{Base margin of call options} = \text{underlying instrument price} \times \text{underlying instrument multiplier} \times \text{short position margin rate of call options based on amount} + \text{short position margin rate of call options based on lots}$$

$$\text{OTM of call options} = max((\text{exercise price} - \text{underlying instrument price}) \times \text{option instrument multiplier}, 0)$$

The margin calculation formulas for put commodity options are:

$$\text{Margin of put commodity options} = [\text{Option price} \times \text{option instrument multiplier} + max(\text{base margin of put options} - \text{OTM of put options}/2, \text{base margin of put options}/2)] \times quantity$$

$$\text{Base margin of put options} = \text{underlying instrument price} \times \text{underlying instrument multiplier} \times \text{short position margin rate of put options based on amount} + \text{short position margin rate of put options based on lots}$$

$$\text{OTM of put options} = max((\text{underlying instrument price} - \text{exercise price}) \times \text{option instrument multiplier}, 0)$$

For **orders**, the order volume is used for calculating the futures order margin. The price is controlled when the parameter value (Name, Target) of YDSystemParam is (OrderMarginBasePrice, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price. It is a default configuration mode and the current mode used by the mainstream OMS
- YD_CBT_OrderPrice: When the order is a market price one, the upper limit price shall prevail; When the order is a price-limited one/FAK/FOK, the order price shall prevail.
- YD_CBT_SamePrice: The same price used as that for the margin rate of futures positions, namely the parameter value obtained when (Name, Target) of YDSystemParam is (MarginBasePrice, Options) is used. When the used margin rate of futures positions is subject to YD_CBT_OpenPrice at this time, the price used for futures order margin will be a pre settlement one

For **pre positions** and **today's positions**, the position volume is used for calculating the futures position margin. The option price is controlled when the parameter value (Name, Target) of YDSystemParam is (MarginBasePrice, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price
- YD_CBT_OpenPrice: The margins corresponding to the position details is calculated one by one according to the open price.
- YD_CBT_LastPrice: Latest price
- YD_CBT_MarketAveragePrice: Average market price
- YD_CBT_MaxLastPreSettlementPrice: The higher one between the latest price and pre settlement price. It is a default configuration mode and the current mode used by the mainstream OMS

For **orders**, **pre positions** and **today's positions**, the underlying instrument price is controlled when the parameter value (Name, Target) of YDSystemParam is (MarginBasePriceAsUnderlying, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price. It is a default configuration mode and the current mode used by the mainstream OMS
- YD_CBT_LastPrice: Latest price
- YD_CBT_MaxLastPreSettlementPrice: The higher one between the latest price and pre settlement price. When the trading volume of the contract is zero for the day, the previous settlement price is used.

6.1.3.2. Stock index option margin

For stock index options traded in CFFEX.

The margin calculation formulas for call stock index options are:

$$\text{Margin of call stock index options} = (\text{option price} \times \text{option instrument multiplier} + max(\text{base margin of call options} - \text{OTM of call options}, \text{minimum boundary coefficient} \times \text{base margin of call options})) \times quantity$$

$$\text{Base margin of call options} = \text{underlying instrument price} \times \text{underlying instrument multiplier} \times \text{short margin rate of call options based on amount}$$

$$\text{OTM of call options} = max((\text{exercise price} - \text{underlying instrument price}) \times \text{option instrument multiplier}, 0)$$

The margin calculation formulas for put stock index options are:

$$\text{Margin of put stock index options} = (\text{option price} \times \text{option instrument multiplier} + max(\text{base margin 1 of put options} - \text{OTM of put options}, \text{minimum boundary coefficient} \times \text{base margin 2 of put options})) \times quantity$$

$$\text{Base margin 1 of put options} = \text{underlying instrument price} \times \text{underlying instrument multiplier} \times \text{short margin rate of put options based on amount}$$

$$\text{Base margin 2 of put options} = \text{exercise price} \times \text{underlying instrument multiplier} \times \text{short margin rate of put options based on amount}$$

$$\text{OTM of put options} = max((\text{underlying instrument price} - \text{exercise price}) \times \text{option instrument multiplier}, 0)$$

The minimum boundary coefficient is obtained when the parameter value (Name, Target) of YDSystemParam is (MarginLowerBoundaryCoef, MarginCalcMethod1). At present, the minimum boundary coefficient of stock index options should be 0.5.

For **orders**, the order volume is used for calculating the option order margin. The option price is controlled when the parameter value (Name, Target) of YDSystemParam is (OrderMarginBasePrice, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price. It is a default configuration mode and the current mode used by the mainstream OMS
- YD_CBT_OrderPrice: When the order is a market price one, the upper limit price shall prevail; When the order is a price-limited one/FAK/FOK, the order price shall prevail.
- YD_CBT_SamePrice: The same price used as that for the margin rate of option positions, namely the parameter value obtained when (Name, Target) of YDSystemParam is (MarginBasePrice, Options) is used. When the used margin rate of option positions is subject to YD_CBT_OpenPrice at this time, the price used for option order margin will be a pre settlement one

For **pre positions** and **today's positions**, the position volume is used for calculating the option position margin. The option price is controlled when the parameter value (Name, Target) of YDSystemParam is (MarginBasePrice, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price.
- YD_CBT_OpenPrice: Open price. The margins corresponding to the position details is calculated one by one according to the open price.
- YD_CBT_LastPrice: Latest price
- YD_CBT_MarketAveragePrice: Average market price
- YD_CBT_MaxLastPreSettlementPrice: The higher one between the latest price and pre settlement price. When the instrument's trading volume is zero for the day, the previous settlement price is used. It is a default configuration mode and the current mode used by the mainstream OMS

For **orders**, **pre positions** and **today's positions**, the position volume is used for calculating the option position margin. The option price is controlled when the parameter value (Name, Target) of YDSystemParam is (MarginBasePrice, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice：Previous Settlement Price. It is a default configuration mode and the current mode used by the mainstream OMS.
- YD_CBT_LastPrice：Latest price
- YD_CBT_MaxLastPreSettlementPrice：The higher one between the latest price and pre settlement price. When the trading volume of the instrument is zero for the day, the previous settlement price is used.

6.1.3.3. Stock option margin

In production, the margin models of stock options can be divided into linear and nonlinear ones. YD OMSs can help to realize these two margin models simultaneously by controlling the parameters of the calculation formula. For example, when the linear coefficient is 1.2 and other parameters are standard values of exchanges (at present, the margin rate of underlying instruments is 12%, and the minimum boundary coefficient is 7%), the linear model should be used; When the margin rate of underlying instruments is 15%, the minimum boundary coefficient is 8%, and the linear coefficient is 1, the non-linear model should be used.

The margin calculation formulas for call stock options are:

$$\begin{aligned}\text{Margin of call stock option} = \text{linear coefficient} \times (\text{option price} + max(&\text{margin rate of underlying instrument} \\ &\times \text{underlying instrument price} - \text{call OTM level}, \text{minimum boundary coefficient} \\ &\times \text{underlying instrument price})) \times \text{option instrument multiplier} \times quantity\end{aligned}$$

$$\text{Call OTM level} = max(\text{exercise price} - \text{underlying instrument price}, 0)$$

The margin calculation formulas for put stock options are:

$$\begin{aligned}\text{Lot margin of short put stock options} = \text{linear coefficient} \times (\text{option price} + min(max(&\text{margin rate of underlying instrument} \\ &\times \text{underlying instrument price} - \text{put OTM level}, \text{minimum boundary coefficient} \\ &\times \text{exercise price}), \text{exercise price} - \text{latest option price})) \times \text{option instrument multiplier} \times quantity\end{aligned}$$

$$\text{Put OTM level} = max(\text{underlying instrument price} - \text{exercise price}, 0)$$

For **orders**, the order volume is used for calculating the option order margin. The option price is controlled when the parameter value (Name, Target) of YDSystemParam is (OrderMarginBasePrice, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price. It is a default configuration mode and the current mode used by the mainstream OMS
- YD_CBT_OrderPrice: When the order is a market price one, the upper limit price shall prevail; When the order is a price-limited one/FAK/FOK, the order price shall prevail.
- YD_CBT_SamePrice: The same price used as that for the margin rate of option positions, namely the parameter value obtained when (Name, Target) of YDSystemParam is (MarginBasePrice, Options) is used. When the used margin rate of option positions is subject to

YD_CBT_OpenPrice at this time, the price used for option order margin will be a pre settlement one

For **pre positions** and **today's positions**, the position volume is used for calculating the option position margin. The option price is controlled when the parameter value (Name, Target) of YDSystemParam is (MarginBasePrice, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price.
- YD_CBT_OpenPrice: Open price. The margins corresponding to the position details is calculated one by one according to the open price.
- YD_CBT_LastPrice: Latest price
- YD_CBT_MarketAveragePrice: Average market price
- YD_CBT_MaxLastPreSettlementPrice: The higher one between the latest price and pre settlement price. It is a default configuration mode and the current mode used by the mainstream OMS

For **orders**, **pre positions** and **today's positions**, the underlying instrument price is controlled when the parameter value (Name, Target) of YDSystemParam is (MarginBasePriceAsUnderlying, Options). The following shows how to handle different parameter values by the system:

- YD_CBT_PreSettlementPrice: Pre settlement price. It is a default configuration mode and the current mode used by the mainstream OMS
- YD_CBT_LastPrice: Latest price
- YD_CBT_MaxLastPreSettlementPrice: The higher one between the latest price and pre settlement price.

6.1.4. Option exercise margin

6.1.4.1. Commodity option exercise margin

The calculation formula for call option margin of commodity options is:

$$\begin{aligned}\text{Exercise margin of call commodity options} = ((&\text{pre settlement price of underlying instrument} \times \text{underlying instrument multiplier} \\ &\times \text{long margin rate of underlying instrument based on amount} + \\ &\text{long margin rate of underlying instrument based on lots}) \times \text{underlying multiplier of options} \\ &+ max(\text{exercise price} - \text{pre settlement price of underlying instrument}, 0) \\ &\times \text{option instrument multiplier}) \times quantity\end{aligned}$$

The calculation formula for put option margin of commodity options is:

$$\begin{aligned}\text{Exercise margin of put commodity options} = ((&\text{pre settlement price of underlying instrument} \times \text{underlying instrument multiplier} \\ &\times \text{short margin rate of underlying instrument based on amount} + \text{short margin rate of underlying instrument based on lots}) \\ &\times \text{underlying multiplier of options} + max(\text{pre settlement price of underlying instrument} \\ &- \text{exercise price}, 0) \times \text{option instrument multiplier}) \times quantity\end{aligned}$$

The underlying multiplier is the UnderlyingMultiply of option instruments.

6.1.4.2. Stock option exercise margin

The calculation formula for exercise margin of call stock options is:

$$\text{Exercise margin of call stock options} = \text{exercise price} \times \text{option multiplier}$$

No margin is required for the exercise of put stock options.

6.1.5. Margin deduction

The main deduction margins of exchanges are divided into one-way large-side margins and combined margins. Although their final effects are similar, their usages and complexities are different. The two deduction methods should be distinguished properly. At present, CFFEX, SHFE, INE and CZCE support the large-side margin operation, while DCE, CZCE, SSE and SZSE support the combined margin operation.

6.1.5.1. One-way large-side margin

CZCE supports **one-way large-side margin under the same instrument**, which is dependent on the sum of long/short speculation, hedging position and order margins under the same instrument, the margin which is relatively higher will be considered as the actual margin of this instrument to be collected.

SHFE and INE support **one-way large-side margin under the same product**, which is dependent on the sum of long/short speculation, hedging position and order margins under the same product, the margin which is relatively higher will be considered as the actual margin of this product to be collected.

CFFEX supports **cross-product one-way large-side margin**, which is dependent on the sum of long/short speculation, hedging position and order margins under the same product group, the margin which is relatively higher will be considered as the actual margin of this product group to be collected. Product groups are defined through "YDProduct.m_pMarginProduct", this field points to the leader product of a product group (the leader product is not fixed and may vary with the initialization data), the leader product and all m_pMarginProduct pointing to the leader product belong to the same product group. At present, CFFEX has two product groups. All stock index futures IF, IC, IH and IM belong to one product group, and all T-bond futures TF, TS and T belong to the other product group.

In order to make it easy for the strategy program to identify instruments that need to be involved in the calculation of one-way large-side margins, when "YDInstrument.SingleSideMargin" is "True", it means that an instrument should be involved in the calculation of a one-way large-side margin, otherwise it will not be involved. Generally, the SingleSideMargin of futures instruments of SHFE, INE and CFFEX are "True", but because the futures instruments that are close to delivery should not be involved in the calculation of one-way large-side margins, they should be set as "False" ones through the SingleSideMargin. The settings of this part are made based on the preday data from the mainstream OMS.

6.1.5.2. Traditional combined margin

YD has developed different combined margin deduction methods for different combination types of exchanges, which are introduced one by one below.

6.1.5.2.1. Futures combination

The following combination types apply to this deduction algorithm:

- YD_CPT_DCE_FuturesOffset: Futures offset of DCE
- YD_CPT_DCE_FuturesCalendarSpread: Futures calendar spread of DCE
- YD_CPT_DCE_FuturesProductSpread: Futures cross-product spread of DCE
- YD_CPT_GFEX_FuturesOffset: Futures offset of GFEX
- YD_CPT_GFEX_FuturesCalendarSpread: Futures calendar spread of GFEX
- YD_CPT_GFEX_FuturesProductSpread: Futures cross-product spread of GFEX
- YD_CPT_CZCE_Spread: Spread of CZCE

A combined futures margin can be obtained by selecting a small side according to the rules first, making the selected small side position margin be a savings margin and then subtracting the savings margin from the sum of the original two-leg margins. The selection rules for small sides are:

- Compare the two-leg futures margins of exchanges and select the smaller side. If they are the same, go to the next step. The calculation formula for exchange futures margins is the same as that for Futures Margin. The pre settlement price and exchange margin rate are used for the calculation. The exchange margin rate can be obtained through "YDInstrument.m_pExchangeMarginRate".
- If combination type is YD_CPT_CZCE_Spread, select the right leg directly, otherwise go to the next step
- Compare the delivery months in relation to the two legs. The farther month side should be selected. If they are the same, go to the next step
- Compare the two-leg instrument codes. The longer instrument code should be selected. An instrument code comparison means a string comparison

6.1.5.2.2. Option straddle

The following combination types apply to this deduction algorithm:

- YD_CPT_DCE_OptionsStraddle: Put option straddle of DCE
- YD_CPT_DCE_OptionsStrangle: Put option strangle of DCE
- YD_CPT_GFEX_OptionsStraddle: Put option straddle of GFEX
- YD_CPT_GFEX_OptionsStrangle: Put option strangle of GFEX
- YD_CPT_CZCE_StraddleStrangle：Put option straddle or strangle of CZCE

The above mentioned combined option margin can be obtained by selecting a small side according to the rules first, calculating the savings margin through the selected small side and then subtracting the savings margin from the sum of the original two-leg margins. The calculation formula for saving margins is: $\text{Exchange option margin} \times \text{position volume}$. The calculation formula of the exchange option margin is the same as that of Option Margin. the pre settlement price and exchange margin rate should be used for the calculation. The exchange margin rate can be obtained through "YDInstrument.m_pExchangeMarginRate". The small side selection rules are:

- Compare the two-leg option margins and select the smaller side. If they are the same, go to the next step;
- Calculate the two-leg savings margins, and select the lower savings margin as the final result.

The following combination types apply to this deduction algorithm:

- YD_CPT_StockOption_KS: Straddle short positions of SSE and SZSE

- YD_CPT_StockOption_KKS: Strangle short positions of SSE and SZSE

The above mentioned combined option margin can be obtained by selecting a small side according to the rules first, calculating the savings margin through the selected small side and then subtracting the savings margin from the sum of the original two-leg margins. The calculation formula for saving margins is:
$(\text{Option margin} - \text{option pre settlement price} \times \text{option instrument multiplier} \times \text{linear coefficient}) \times \text{position volume}$. The small side selection rules are:

- Compare the two-leg option margins and select the smaller side. If they are the same, go to the next step;
- Calculate the two-leg savings margins, and select the lower savings margin as the final result.

6.1.5.2.3. Sell option coverage

The following combination types apply to this deduction algorithm:

- YD_CPT_DCE_SellOptionsCovered: Sell options covered of DCE
- YD_CPT_GFEX_SellOptionsCovered: Sell options covered of GFEX
- YD_CPT_CZCE_SellOptionConvered: Sell options covered of CZCE

The combined margin can be obtained by calculating the savings margin relying on the left leg directly and then subtracting the savings margin from the sum of the original two-leg margins. The calculation formula for saving margins is:
$\text{Exchange option margin} \times \text{position volume}$. The option price specified by the parameter value obtained when (Name, Target) of YDSystemParam is (MarginBasePrice, Options) is used in the formula. The calculation formula of the exchange option margin is the same as that of Commodity Option Margin. The pre settlement price and exchange margin rate should be used for the calculation. The exchange margin rate can be obtained through "YDInstrument.m_pExchangeMarginRate".

6.1.5.2.4. Buy option coverage

The following combination types apply to this deduction algorithm:

- YD_CPT_DCE_OptionsOffset: Options offset of DCE
- YD_CPT_DCE_BuyOptionsVerticalSpread: Vertical spread of buy options of DCE
- YD_CPT_DCE_BuyOptionsCovered: Buy options covered of DCE
- YD_CPT_GFEX_OptionsOffset: Options offset of GFEX
- YD_CPT_GFEX_BuyOptionsVerticalSpread: Vertical spread of buy options of GFEX
- YD_CPT_GFEX_BuyOptionsCovered: Buy options covered of GFEX

When investors close the buy legs of the above combination, an additional margin will be required. If the available funds on the mainstream OMS are insufficient for the additional margin, the position closing operation will be prohibited. YD believes that the prohibition of position closing will affect the release of risks and may cause higher risks instead, which also violates YD's principle of Position Closing without Fund Checking. Therefore, the available funds may become negative when buy legs are closed by YD. The above measure is at the discretion of brokers. If the brokers have any objection to this measure, they can disable the margin deduction function of this combination. After the function is disabled, combination is still allowed, but no margin deduction will be allowed, thus margin call liquidation will not be caused during position closing. If the brokers accept YD's measure, they can enable this function. For the initial installation, this function is disabled by default. Investors can check the function for being enabled when the parameter value of (Name, Target) of YDSystemParam is (PortfolioMarginConcession, DCELongOptionPortfolio).

If the deduction is enabled, the combined margin can be obtained by calculating the savings margin relying on the right leg directly and then subtracting the savings margin from the sum of the original two-leg margins. The calculation formula for saving margins is:
$(1 - \text{combined margin discount}) \times \text{option margin} \times \text{position volume}$. The combined margin discount in the formula is "YDCombPositionDef.Parameter". Please refer to Traditional combined Position Definition for details.

6.1.5.2.5. Vertical spread of sell options

The following combination types apply to this deduction algorithm:

- YD_CPT_DCE_SellOptionsVerticalSpread: Vertical spread of sell options of DCE
- YD_CPT_GFEX_SellOptionsVerticalSpread: Vertical spread of sell options of GFEX

When investors close the buy legs of the above combination, an additional margin will be required. If the available funds on the mainstream OMS are insufficient for the additional margin, the position closing operation will be prohibited. YD believes that the prohibition of position closing will affect the release of risks and can cause higher risks instead, which also violates YD's principle of Position Closing without Fund Checking. Therefore, the available funds may become negative when buy legs are closed by YD. The above measure is at the discretion of brokers. If the brokers have any objection to this measure, they can disable the margin deduction function of this combination. After the function is disabled, combination is still allowed, but no margin deduction will be allowed, thus margin call liquidation will not be caused during position closing. If the brokers accept YD's measure, they can enable this function. For the initial installation, this function is disabled

by default. Investors can check the function for being enabled when the parameter value of (Name, Target) of YDSystemParam is (PortfolioMarginConcession, DCELongOptionPortfolio).

If the deduction is enabled, the combined margin can be obtained by calculating the savings margin relying on the right leg directly and then subtracting the savings margin from the sum of the original two-leg margins. The calculation formula for saving margins is:

$$max(\text{right leg option margin} - |\text{left leg exercise price} - \text{right leg exercise price}| \times \text{left leg instrument multiplier}, 0) \times \text{position volume}$$

6.1.5.2.6. Bull and bear spreads

The following combination types apply to the deduction algorithms below:

- YD_CPT_StockOption_CNSJC: Bull call spreads of SSE and SZSE
- YD_CPT_StockOption_PXSJC: Bear put spreads of SSE and SZSE

The combined margin can be obtained by calculating the savings margin relying on the right leg directly and then subtracting the savings margin from the sum of the original two-leg margins. The calculation formula for saving margins is:
$\text{Right leg margin per lot} \times \text{position volume}$. The right leg margin per lot means the actual right leg margin, refer to Stock Option Margin for the specific calculation method.

The following combination types apply to the deduction algorithms below:

- YD_CPT_StockOption_CXSJC: Bear call spreads of SSE and SZSE
- YD_CPT_StockOption_PNSJC: Bull put spreads of SSE and SZSE

The combined margin can be obtained by calculating the savings margin relying on the right leg directly and then subtracting the savings margin from the sum of the original two-leg margins. The calculation formula for saving margins is:

$$(\text{Right leg margin per lot} - |\text{left leg exercise price} - \text{right leg exercise price}| \times \text{right leg instrument multiplier} \times \text{right leg linear coefficie}$$

The right leg margin per lot means the actual right leg margin, refer to Stock Option Margin for the specific calculation method.

6.1.6. Trial calculation of margins

The calculation of margins and combined margin deductions is relatively complex. In order to facilitate investors using ydExtendedApi to pre-calculate margins at a specified price, YD provides a series of methods.

6.1.6.1. Trial calculation of order margins

Investors can obtain the futures margin per order lot at any time through the following method. The trial calculation does not involve the large-side margin except the order margin. This method is not applicable to combined instruments.

```
virtual double getMarginPerLot(const YDInstrument *pInstrument,int hedgeFlag,int anyDirection,double
openPrice,const YDAccount *pAccount=NULL)
```

The parameters involved in the above method are as follows:

Parameter	Description
pInstrument	Instrument pointer
hedgeFlag	Hedge flag. YD_HF_Speculation=1: Speculation YD_HF_Arbitrage=2: Arbitrage, only supported by CFFEX. YD_HF_Hedge=3: Hedge
anyDirection	Trading direction, YD_D_Buy or YD_PD_Long can be used for representing "Buy", YD_D_Sell or YD_PD_Short can be usded for representing "Sell"

Parameter	Description
openPrice	The price used is determined when the parameter value (Name, Target) of YDSystemParam is (MarginBasePrice, Options): YD_CBT_PreSettlementPrice: The pre settlement price shall always be used, openPrice is invalid YD_CBT_OpenPrice: The value specified by openPrice shall be used YD_CBT_LastPrice: The latest price shall always be used, openPrice is invalid YD_CBT_MarketAveragePrice: The average market price shall always be used, openPrice is invalid YD_CBT_MaxLastPreSettlementPrice: Usually, the higher value between the latest price and the previous settlement price is used. When the instrument's daily trading volume is zero, the previous settlement price is used. OpenPrice is invalid
pAccount	Set to NULL

Investors can obtain the option margin per order lot at any time through the following method. The price used for the trial calculation is selected by API according to the price settings.

```
virtual double getOptionsShortMarginPerLot(const YDInstrument *pInstrument,int hedgeFlag,bool
includePremium,const YDAccount *pAccount=NULL)
```

The parameters involved in the above method are as follows:

Parameter	Description
pInstrument	Instrument pointer
hedgeFlag	Hedge flag. The definition of hedge flags is different for futures exchanges and stock option exchanges. The definition for futures exchanges is as follows: YD_HF_Speculation=1: Speculation YD_HF_Arbitrage=2: Arbitrage, only supported by CFFEX. YD_HF_Hedge=3: Hedge The definition for stock option exchanges is as follows: YD_HF_Normal=1: Normal YD_HF_Covered=3: covered
includePremium	Including a premium or not
pAccount	Set to NULL

6.1.6.2. Trial calculation of position margins

The following method can be used for calculating the margin per position lot under different prices. A full position margin can be obtained by multiplying it by the position volume. For futures positions, the large-side margin is not calculated. Unlike the trial calculation of order margin, the openPrice here is not affected by YDSystemParam, and the price specified by openPrice in the parameters is directly used for calculating the underlying price.

```
virtual double getMarginPerLot(const YDExtendedPosition *pPosition,double openPrice)
```

6.1.6.3. Trial calculation of combined margin

The following method can be used for trial calculation for a combination which does not exist. The pre settlement price is used for the trial calculation, so it may be different from the actual margin to be collected after combination.

```
virtual double getCombPositionMarginPerLot(const YDCombPositionDef *pCombPositionDef,const YDAccount
*pAccount=NULL)
```

The following method can help to obtain the true two-leg margin, savings margin and combined margin in relation to position details, $\text{Combined margin} = \text{left-leg margin} + \text{right-leg margin} - \text{savings margin}$, where the left-/right-leg margins are legMargins[0] and legMargins[1], respectively, and the savings margin is the return value based on this method.

```
virtual double getCombPositionMarginSaved(const YDExtendedCombPositionDetail *pCombPositionDetail,double
legMargins[])
```

6.2. Portfolio Margin Model

Due to the specific logic of margin calculation algorithms being publicly disclosed by various exchanges, this article will not further discuss it. For more details, please refer to the relevant documents provided by the exchanges.

The YD portfolio margin model is consistent with CTP, and the following will introduce the common and differential parts of the portfolio margin model.

6.2.1. General Concepts of Portfolio Margin Model

6.2.1.1. Investor Margin Coefficient

Similar to traditional margin, brokers multiply the investor margin coefficient (typically greater than 1) with the exchange portfolio margin to determine the frozen margin for investors during trading, in order to control risks in extreme situations. In the traditional margin model, the investor margin coefficient can be set at the product level. However, in the portfolio margin model, the investor margin coefficient is set at the portfolio margin model level. The investor margin coefficient is derived from CTP's initial data and can be obtained through 'YDAccountMarginModelInfo.MarginRatio'. It can be dynamically adjusted during trading hours. For more details, please refer to Account Combination Margin Parameters.

Therefore, in the portfolio margin model, the margin formula for investors in a specific portfolio margin model is as follows:

$$\text{Investor Margin} = \text{Exchange Margin} \times \text{Investor Margin Coefficient}$$

6.2.1.2. Closing Position Check

In some portfolio margin models, additional margin may be required upon closing a position. If the available funds are insufficient to cover the additional margin, it may result in fund overdraft. To address this, YD provides a Closing Position Check mode.

The Closing Position Check mode is used to control whether YD counter checks the available funds upon receiving a closing order. This parameter is derived from CTP's initial data and can be obtained through 'YDAccountMarginModelInfo.CloseVerify'. It can be dynamically adjusted during trading. For more details, please refer to account-combination-margin-parameters. The currently supported modes are as follows:

- YD_CV_NotVerify：No Verification
- YD_CV_Verify：Verification. The verification logic is as follows:
  - If it results in an increase in available funds, regardless of whether the available funds are less than 0 at this point, it is approved. Otherwise, continue to evaluate.
  - If the portfolio margin model specifically requests no verification for the current situation, it is approved. Otherwise, continue to evaluate.
  - If the available funds, after deducting the additional margin, are greater than or equal to 0, it is approved. Otherwise, it is not approved.

6.2.1.3. Applicable Range

In some portfolio margin models, a subset of products can be set as the applicable range for investors in that portfolio margin model. For example, the products that are applicable for the SPBM model include MA, PF, and SR, but it is possible to set that a particular investor only uses MA and PF. The applicable range is derived from CTP's preday data and can be obtained through 'YDAccountMarginModelInfo.ProductRange'. It cannot be dynamically adjusted during trading. For more details, please refer to Account Portfolio Margin Parameters.

For products that belong to the portfolio margin model but are not applicable to a specific client, the traditional margin model is still used to calculate the margin for those products.

6.2.2. CZCE SPBM

Based on the standard model of SPBM, the following revisions are made according to the business logic of the mainstream OMS.

6.2.2.1. Freezing Additional Margin

According to the SPBM standard model, margin reduction is possible upon order submission. To avoid such issues, when the discount ratio of the intracommodity lock fee rate within a product family (IntraRateY) is less than 1, an additional margin freeze will be imposed. The calculation formula for the freezing of additional margin is as follows:

$$\begin{aligned}\text{freezing additional margin} = (&\text{Intra-Commodity Hedge Margin} - min(\text{Long Position Margin}，\ \text{Short Position Margin})) \\ &\times(1 - IntraRateY)\end{aligned}$$

The aforementioned long position margin and short position margin are calculated based on the SPBM standard model, where the calculation of buying margin and selling margin for a commodity only includes the portion held in positions.

Similarly, a similar issue arises when the discount ratio of the intracommodity lock fee rate within a product family (IntraRateZ) is less than 0.5. However, considering the complexity of the calculation and the fact that there is currently no such situation in the SPBM production parameters, it is not implemented at the moment.

6.2.2.2. Closing Position Verification

In the closing position verification, this portfolio margin model does not require verification for closing long positions in options.

6.2.2.3. Exercise Margin

When exercising and abandoning automatic exercise, the corresponding position needs to be deducted from the value of the long option, using the same deduction method as closing the option. For exercise requests, exercise margin needs to be frozen simultaneously.

$$\begin{aligned}\text{Exercise Margin} = \text{Exercise Quantity} \times (&\text{Initial Margin per lot of Underlying Futures} \\ &+\text{Out-of-the-Money Amount Calculated Based on Previous Settlement})\end{aligned}$$

$$\begin{aligned}\text{Initial Margin per lot of Underlying Futures} = \text{Investor Margin Coefficient} \times （&\text{Instrument Multiplier} \times \text{pre-settlement price} \\ &\times \text{Margin Standard for the Product} + \text{Instrument Multiplier} \\ &\times \text{pre-settlement price} \times \text{Increased Margin Standard for the Instrument}）\end{aligned}$$

6.2.3. DCE Rule

Based on the Rule standard model, the following revisions are made according to the business logic of the mainstream OMS.

6.2.3.1. Exercise Margin

When exercising and abandoning automatic exercise, the portfolio margin is recalculated using the closing position freeze method. The exercise margin per lot is 0.

7. Trade

7.1. Supported operation

7.1.1. Orders

Order instructions are the most common. Investors can call an order instruction to initiate a futures and options trade. Instructions that can be used for orders are as follows.

```
virtual bool insertOrder(YDInputOrder *pInputOrder,const YDInstrument *pInstrument,const YDAccount *pAccount=NULL)=0;
virtual bool insertMultiOrders(unsigned count,YDInputOrder inputOrders[],const YDInstrument *instruments[],const YDAccount *pAccount=NULL)=0;

// only available in ydExtendedApi
virtual bool checkAndInsertOrder(YDInputOrder *pInputOrder,const YDInstrument *pInstrument,const YDAccount *pAccount=NULL)=0;
virtual bool checkOrder(YDInputOrder *pInputOrder,const YDInstrument *pInstrument,const YDAccount *pAccount=NULL)=0;
```

7.1.1.1. Normal orders

First, the order instruction insertOrder is the most normal. If a "False" regarding this function is sent back, it means that the network to an OMS is interrupted.

```
virtual bool insertOrder(YDInputOrder *pInputOrder,const YDInstrument *pInstrument,const YDAccount *pAccount=NULL)=0;
```

The parameters of the above method are described as follows:

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For providing YD_YOF_Normal information
	OrderRef	Customer order reference No. The OMS can show notified customer order reference numbers, and investors can match their orders with the notifications.
	Direction	YD_D_Buy: Buy YD_D_Sell: Sell
	OffsetFlag	For **Normal instruments**: YD_OF_Open: Open position YD_OF_Close: Close position, which are unapplicable to SHFE and INE. If used in SHFE and INE, they will be regarded as YD_OF_CloseYesterday YD_OF_CloseYesterday: Close pre position, which is applicable to SHFE and INE. It will be regarded as YD_OF_Close YD_OF_CloseToday: Close today's position if not used in SHFE and INE. It is applicable to SHFE and INE. It will be regarded as YD_OF_Close if not used in SHFE and INE. For **Combined instruments**: YD_OF_Open: Open the left and right legs at the same time YD_OF_Close: Close the left and right legs at the same time YD_OF_Open1Close2: Open the left leg and close the right leg YD_OF_Close1Open2: Close the left leg and open right leg
	HedgeFlag	YD_HF_Speculation: Speculation YD_HF_Arbitrage: Arbitrage, only supported by CFFEX YD_HF_Hedge: Hedge
	OrderType	YD_ ODT_ Limit: Price-limited order YD_ODT_Market: market price order YD_ODT_FAK: FAK order YD_ODT_FOK: FOK order

Parameter	Field	Description
	Price	Providing price information. The price shall not exceed the upper/lower limits. YD does not control the price fluctuation zone
	OrderVolume	The open and close position volumes are subject to the following: They should not be higher than the MaxMarketOrderVolume and MaxLimitOrderVolume of instruments They should not be lower than MinMarketOrderVolume and MinLimitOrderVolume of instruments They should not be higher than the position limit. Note: For SSE and SZSE, the combined position volume is excluded
	OrderTriggerType	Trigger type YD_OTT_NoTrigger: No trigger YD_OTT_TakeProfit: Profit taking trigger YD_OTT_StopLoss: Loss stopping trigger At present, triggered orders of DCE and GFEX are supported
	TriggerPrice	Trigger price
YDInstrument		For specifying a trading instrument pointer
YDAccount		The given "NULL" means that the current API login account is used

The OrderType defined in the YD system is the combination of exchange order type conditions. The combination being the closest to YD's order types for each exchange should be set. The following shows the comparison relationship for each exchange:

Exchange	YD_ODT_Limit	YD_ODT_FAK	YD_ODT_Market	YD_ODT_FOK
CFFEX	FFEX_FTDC_TC_GFD FFEX_FTDC_OPT_LimitPrice FFEX_FTDC_VC_AV	FFEX_FTDC_TC_IOC FFEX_FTDC_OPT_LimitPrice FFEX_FTDC_VC_AV	FFEX_FTDC_TC_IOC FFEX_FTDC_OPT_AnyPrice FFEX_FTDC_VC_AV	FFEX_FTDC_TC_IOC FFEX_FTDC_OPT_LimitPrice FFEX_FTDC_VC_CV
SHFE	SHFE_FTDC_TC_GFD SHFE_FTDC_OPT_LimitPrice SHFE_FTDC_VC_AV	SHFE_FTDC_TC_IOC SHFE_FTDC_OPT_LimitPrice SHFE_FTDC_VC_AV	Not supported. Before use, it should be converted to: SHFE_FTDC_TC_IOC SHFE_FTDC_OPT_AnyPrice SHFE_FTDC_VC_AV	SHFE_FTDC_TC_IOC SHFE_FTDC_OPT_LimitPrice SHFE_FTDC_VC_CV
DCE	OT_LO OA_NONE	OT_LO OA_FAK	OT_MO OA_FAK	OT_LO OA_FOK

CZCE	FID_OrderType=0 // Limited price
	FID_MatchCondition=3 // Valid on the current day
		FID_OrderType=0 // Limited price
		FID_MatchCondition=2 // Immediate partial traded
			FID_OrderType=1 // Market price
			FID_MatchCondition=2 // Immediate partial traded
				FID_OrderType=0 // Price
				FID_MatchCondition=1 // Immediate all traded

GFEX	OT_LO OA_NONE	OT_LO OA_FAK	OT_MO OA_FAK	OT_LO OA_FOK
SSE	OrderType=Limit TimeInForce=GFD	Not supported. It should be converted to YD_ODT_FOK before use	OrderType=Market TimeInForce=IOC	OrderType=Limit TimeInForce=FOK
SZSE	OrderType=Limit TimeInForce=GFD MinQty=0	Not supported. It should be converted to YD_ODT_FOK before use	OrderType=Market TimeInForce=IOC MinQty=0	OrderType=Limit TimeInForce=GFD MinQty=OrderVolume

7.1.1.2. Multi-orders

Multi-orders includes not more than 16 orders each time, meeting customers' demand for simultaneous multi-leg order submission. Compared with repeated common report calling, it is not superior in overall performance. It is not suggested to select multi-orders for performance purposes. The following shows the analysis from both sending and receiving:

- When sending by a client, the advantage of multi-orders is that the number of API calls can be reduced, but the sending is only allowed after all orders are prepared, while normal orders can be prepared one by one and sent immediately, which is more efficient considering resource utilization; In addition, multi-orders are more time-consuming since being always sent from large packages.
- When receiving at an OMS, multi-orders are also received and processed in sequence, so the processing performance is basically the same as that for multiple normal orders

```
virtual bool insertMultiOrders(unsigned count,YDInputOrder inputOrders[],const YDInstrument *instruments[],const YDAccount *pAccount=NULL)
```

When all multi-orders are sent, a "True" will be sent back. When part of or multi-orders are not sent, a "False" will be sent back. The parameters can be given according to the following method:

Parameter	Description
unsigned count	Count of orders: 16 at most
YDInputOrder inputOrders[]	Order arrays corresponding to instrument pointer arrays
YDInstrument *instruments[]	Trading instrument pointer array
YDAccount	The given "NULL" means that the current API login account is used

After receiving the multi-orders, the processing method of YD OMSs for each order is the same as that of normal single orders: namely, each order means an independent trade, and successfully processed orders will not be returned as a whole even when risk control of the subsequent order fails, and those false orders in the front will not affect the processing of the subsequent orders. Therefore, the notification and cancellation in relation to multi-orders are the same as those to ordinary orders, except that notification callbacks will be conducted.

7.1.1.3. Local risk control orders

In ydExtendedApi, a series of instructions for risk control and order submission at the client are added. These instructions have been additionally provided with local money position and risk control checks to the corresponding orders. If the risk control fails, a "False" will be sent back directly. The error reason can be obtained from ErrorNo under YDInputOrder. Compared with original order instructions, when an instruction is easier to be intercepted by the risk control function at an OMS, the local risk control order instruction can help to more quickly show whether the orders can **pass the money position and risk control checks at the OMS with a high probability**, which facilitates the communication with the OMS and, correspondingly, increases the time cost of orders at the client. Therefore, the corresponding order instructions shall be chosen according to the actual conditions.

```
virtual bool checkAndInsertOrder(YDInputOrder *pInputOrder,const YDInstrument *pInstrument,const YDAccount
*pAccount=NULL)
```

When the local risk control function is used for order submission, the OrderRef under YDInputOrder is coded by the API from 1. Even if a user assigns a value to OrderRef, it will be overwritten by the API. The OrderRef encoding mechanism makes use of the connection number encoding mechanism of ydExtendedApi, namely, local risk control and order submission naturally support multiple connection numbers. Please refer to Multi connection for details. After the call function is notified, the OrderRef used for order submission can be found in the incoming YDInputOrder.OrderRef. If the checks fail, the reason for the failure of risk control and order submission can also be found in YDINputOrder.ErrorNo.

Orders passing the local risk control checks does not mean that they can pass the risk control check at the OMS, which may be caused by, but are not limited to the following reasons:

- The market fluctuates greatly, and the time for position profit/loss and margin refresh through the OMS is inconsistent with that through the client, resulting in insufficient funds at the OMS though sufficient at the client;
- If investors conduct trade via the same account relying on more than one strategy, the OMS check may fail due to the impact of other strategy orders;
- Some risk control measures are only checked at the OMS.

When using the multi-order instructions regarding local risk control, the orders can only be submitted after passing the risk control check, which is different from the processing behavior of the multi-orders at the OMS.

Investors can also use the following instructions for checking without submitting orders:

```
virtual bool checkOrder(YDInputOrder *pInputOrder,const YDInstrument *pInstrument,const YDAccount
*pAccount=NULL)
```

7.1.1.4. Order notification

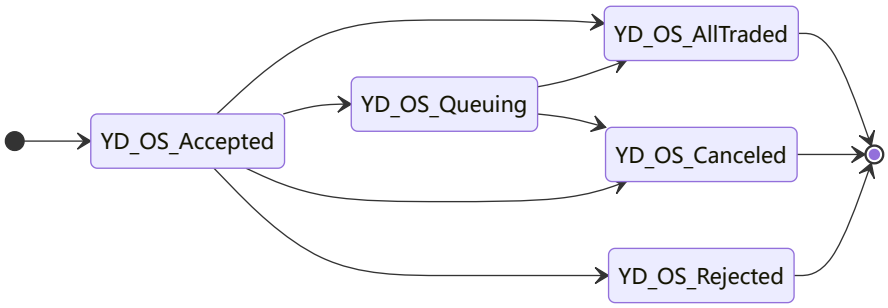
All true or false exchange notifications will be sent back through notifyOrder. After receiving a notification, if the value of "YDOrder.ErrorNo" is 0, it will be process as a true one; If the value of "YDOrder.ErrorNo" is not 0, it will be processed as a false one.

```
virtual void notifyOrder(const YDOrder *pOrder,const YDInstrument *pInstrument,const YDAccount *pAccount)
```

If an order passes the OMS risk control check and is sent to an exchange, the notification will not be sent to the investor by default before receiving the notification from the exchange. However, the investor can ask the broker to enable the OMS notification function to receive the notification from the OMS. The investor can check the OMS notification function for being enabled depending on whether YD_AF_NotifyOrderAccept is set through AccountFlag of YDAccount. The OMS notification can be used as a credential for the OMS receiving the investor's order application. Investors worrying about missing of UDP orders can check for missed UDP package earlier through this

mechanism. OMS notifications are sent back through notifyOrder, whose OrderStatus is YD_OS_Accepted. Except OrderSysID and InsertTime, other fields have been assigned correctly and can be used normally. Except those RFQs and option hedging instructions of DCE and GFEX, OMS notifications in relation to all other orders using the insertOrder series order instructions can be received.

When receiving notifications from an exchange, YD OMS will send order notifications to investors through notifyOrder accordingly. The status, quantity and sequence of notifications are related to the specific behavior of the exchange. For example, the YD_OS_Queuing statuses of some exchange FAK and FOK orders will not be sent back except final order notifications. For another example, if the price-limited orders of CFFEX are all traded when involved in the matching queue for the first time, only an all-traded notification rather than a queuing notification will be sent back. The exchanges do not and will not commit to the behavior of sending notifications and have the right to change this behavior at any time. However, both YD and exchanges ensure that the notification status is always transferred depending on the order status machine. Therefore, investors should not rely on the notification behavior of exchanges when developing strategy programs but should ensure that they can correctly handle regardless of the notification sequence received. The status machine diagram of orders is shown below.



The parameters sent back by notifyOrder are described as follows. The fields sent back through YDInputOrder will not be described:

Parameter	Field	Description
YDOrder	YDOrderFlag	Fixed to YD_YOF_Normal
	TradeVolume	Accumulated order trade volume
	OrderLocalID	Local OMS ID. Local ID numbering uniformly and globally starts in sequence from 1, which is independent of the connection. If orders are sent from other OMSs, such as the primary OMS or other secondary OMSs, the ID will always be -1
	OrderSysID	For futures exchanges, it refers to a system order ID number sent back by an exchange For spot exchanges, it refers to a converted order ID number of a virtual exchange. To obtain the real exchange order ID numbers, refer to the following contents If the exchange order ID number exceeds the maximum length of OrderSysID, part of it will be truncated
	LongOrderSysID	For futures exchanges, it refers to a system order ID number sent back by an exchange For spot exchanges, it refers to a converted order ID number of a virtual exchange. To obtain the real exchange order ID numbers, refer to the following contents The exchange order ID number will not be truncated for the sake of a full-accuracy
	InsertTime	Second counts from the beginning (17:00) to the order submission time of a trading day. For example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between YD's integral time and reference time, see string2TimeID and timeID2String of ydUtil.h

Parameter	Field	Description
	InsertTimeStamp	Millisecond counts from the beginning (17:00) to the order submission time of a trading day. For example: 500 ms past 21:00 in night trading hours: 3600*(21-17)*1000+500 = 14400500 500 ms past 9:00 in day trading hours: 3600*(24+9-17)*1000+500 = 57600500 500 ms past 9:00 in Monday's trading hours: 3600*(24+9-17)*1000+500 = 5760500 For the conversion between YD's timestamp time and reference time, see string2TimeStamp and timeStamp2String of ydUtil.h
	CancelTimeStamp	Millisecond counts from the beginning (17:00) to the order cancellation time of a trading day. For example: 500 ms past 21:00 in night trading hours: 3600*(21-17)*1000+500 = 14400500 500 ms past 9:00 in day trading hours: 3600*(24+9-17)*1000+500 = 57600500 500 ms past 9:00 in Monday's trading hours: 3600*(24+9-17)*1000+500 = 5760500 For the conversion between YD's timestamp time and reference time, see string2TimeStamp and timeStamp2String of ydUtil.h
	OrderTriggerStatus	Order trigger status YD_OTS_NotTriggered: Not triggered YD_OTS_Triggered: Triggered
	OrderStatus	The possible statuses and notification status machine are shown below: YD_OS_Accepted: the OMS accepted, which will only appear in OMS notifications YD_OS_Queuing: Queuing YD_OS_AllTraded: All traded YD_OS_Canceled: Canceled, including those orders traded or canceled YD_OS_Rejected: Error orders of exchanges
	ErrorNo	It will be 0 when the trade is made successfully, and the exchange error number when an error occurs
YDInstrument		Order Instrument pointer
YDAccount		Current API login account

Since the exchange order ID numbers, combination numbers and exercise numbers used by SSE and SZSE are not integers, YD cannot directly put these numbers sent back by exchanges into the OrderSysID field but fill in it with digitally converted native exchange numbers. The following two methods show native exchange numbers.

For investors using ydApi and ydExtendedApi, the native order ID numbers can be received through the notifyIDFromExchange callback function of YDListener. Such callback can only be received after the exchange number is converted, which will not be received when the trade is made in futures exchanges.

```
virtual void notifyIDFromExchange(const YDIDFromExchange *pIDFromExchange,const YDExchange *pExchange)
```

The notified parameters are described as follows:

Parameter	Field	Description

Parameter	Field	Description
YDIDFromExchange	IDType	ID type, possible values are as follows: YD_IDT_NormalOrderSysID: Normal order ID No. YD_IDT_QuoteDerivedOrderSysID: Quote Derived order ID No. YD_IDT_OptionExecuteOrderSysID: Option exercise order ID No. YD_IDT_OptionAbandonExecuteOrderSysID: option abandon exercise order ID No. YD_IDT_RequestForQuoteOrderSysID: RFQ order ID No. YD_IDT_CombPositionOrderSysID: Combined order ID No. YD_IDT_OptionExecuteTogether: Combined exercise order ID No. YD_IDT_Mark: Combined order ID No. YD_IDT_OptionSelfClose：Option Hedge ID No. YD_IDT_FreezeUnderlying：Bond Locking and Unlocking ID No. YD_IDT_Cover: Covered order ID No. YD_IDT_TradeID: Traded ID No. YD_IDT_CombPositionDetailID: Combination detail ID No. YD_IDT_QuoteSysID: Quote ID No.
	IDInSystem	The ID value converted by YD OMS may be truncated
	LongIDInSystem	Full-accuracy ID value converted by YD OMS
	IDFromExchange	Exchange's native ID value, max. length: 24 bytes
YDExchange		Exchange pointer

For investors using ydExtendedApi, the native ID numbers can also be directly queried through getIDFromExchange. For the meaning of the parameters to be entered for query, see the table above. The maximum length of the native ID number sent back is 24 bytes.

```
virtual const char *getIDFromExchange(const YDExchange *pExchange,int idType,int idInSystem)
```

7.1.1.5. Extended order notification

If YDExtendedListener is used by investors, notifications can be received through notifyExtendedOrder under the following circumstances:

- In case of a notifyOrder callback, regardless of true or false orders, regardless of orders rejected by the OMS or an exchange
- In case of an attribute change of YDExtendedOrder
- In case of a successful order submission and sending through checkAndInsertOrder

```
virtual void notifyExtendedOrder(const YDExtendedOrder *pOrder)
```

Since YDExtendedTrade comes from YDTrade, exclusive fields of YDExtendedTrade are:

Field	Description
m_pInstrument	Order instrument pointer
m_pCombPositionDef	The order type is YD_YOF_CombPosition, which is valid for combining or decombining and defines the pointer for traditional combined positions
m_pAccount	Pointer of investor to which orders belong
m_pInstrument2	The order type is YD_YOF_OptionExecuteTogether, which is valid in case of combined exercise and is the pointer of the second instrument for combined exercise

7.1.1.6. Trade notification

When a trade is generated, a trade notification will be sent back through notifyTrade. The OrderRef, OrderLocalID, and OrderSysID of the trade notification can be used for correlating to a specific order.

```
virtual void notifyTrade(const YDTrade *pTrade,const YDInstrument *pInstrument,const YDAccount *pAccount) {}
```

The return values of the trade notification are as follows, those fields being the same as those of orders will not be described again:

Parameter	Field	Description

Parameter	Field	Description
YDTrade	TradeID	The trade ID number sent back by an exchange If the exchange order ID number exceeds the maximum length of the TradeID, part of it will be truncated
	OrderLocalID	Local OMS ID. Local ID numbering uniformly and globally starts in sequence from 1, which is independent of the connection. If orders are sent from other OMSs, such as the primary OMS or other secondary OMSs, the ID will always be -1
	LongTradeID	Full-accuracy trade ID number sent back from an exchange
	OrderSysID	For futures exchanges, it refers to a system order ID number sent back by an exchange For spot exchanges, it refers to a converted order ID number of a virtual exchange. To obtain the real exchange order ID numbers, see the following contents If the exchange order ID number exceeds the maximum length of OrderSysID, part of it will be truncated
	LongOrderSysID	For futures exchanges, it refers to a system order ID number sent back by an exchange For spot exchanges, it refers to a converted order ID number of a virtual exchange. To obtain the real exchange order ID numbers, see the following contents The exchange order ID number will not be truncated for the sake of a full-accuracy
	OrderRef	Investor's order reference No.
	OrderGroupID	Order group ID number to which an order belongs
	Price	Trade price
	Volume	Trade volume
	Commission	Trade commission
	TradeTime	Second counts from the beginning (17:00) to the trade time of a trading day. For example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between the TimeID and reference time, see string2TimeID and timeID2String of ydUtil.h
	TradeTimeStamp	Millisecond counts from the beginning (17:00) to the trade time of a trading day. For example: 500 ms past 21:00 in night trading hours: 3600*(21-17)*1000+500 = 14400500 500 ms past 9:00 in day trading hours: 3600*(24+9-17)*1000+500 = 57600500 500 ms past 9:00 in Monday's trading hours: 3600*(24+9-17)*1000+500 = 5760500 For the conversion between YD's timestamp time and reference time, see string2TimeStamp and timeStamp2String of ydUtil.h
YDInstrument		Trade instrument pointer
YDAccount		Current API login account

7.1.1.7. Extended trade notification

If an investor uses YDExtendedListener, the notifyExtendedTrade will be called back in case of a notifyTrade callback:

```
1 virtual void notifyExtendedTrade(const YDExtendedTrade *pTrade)
```

Since YDExtendedTrade comes from YDTrade, exclusive fields of YDExtendedTrade are:

Field	Description
m_pInstrument	Trade instrument pointer
m_pAccount	Investor pointer to which a trade belongs

7.1.2. Order cancellation

Investors can call the following function to cancel orders under queuing (the OrderStatus is YD_OS_Queuing).

```
virtual bool cancelOrder(YDCancelOrder *pCancelOrder,const YDExchange *pExchange,const YDAccount *pAccount=NULL)
virtual bool cancelMultiOrders(unsigned count,YDCancelOrder cancelOrders[],const YDExchange *exchanges[],const YDAccount *pAccount=NULL)
```

7.1.2.1. Normal order cancellation

The following method can be used to cancel a single order. If a "False" regarding this function is sent back, it means that the network to an OMS is interrupted.

```
virtual bool cancelOrder(YDCancelOrder *pCancelOrder,const YDExchange *pExchange,const YDAccount *pAccount=NULL)
```

The parameters of the above method are described as follows:

Parameter	Field	Description
YDCancelOrder	YDOrderFlag	For providing the type information of orders to be cancelled
	OrderSysID	Exchange order ID No.
	LongOrderSysID	Full-accuracy exchange order ID No.
	OrderGroupID	For specifying the logical group to which an order and a quote belong. When it is used together with OrderRef, OrderRef orders can be cancelled
	OrderRef	Investor's order reference No. When it is used together with OrderGroupID, OrderRef orders can be cancelled
YDExchange		Exchange for order cancellation
YDAccount		The given "NULL" means that the current API login account is used

The OMSs support three order cancellation modes, including LongOrderSysID, OrderSysID, and OrderRef. The OrderRef order cancellation mode allows investors to cancel orders before receiving notifications. Currently, it is supported by CFFEX, SHFE, INE, DCE, SSE and SZSE. The logic of the cancellation mode is as follows:

- First, judge the OrderGroupID. If the OrderGroupID is 0, continue to evaluate the value of LongOrderSysID. Otherwise, proceed with the logic for non-zero OrderGroupID.
  - If LongOrderSysID is not 0, the LongOrderSysID can be used for cancelling orders
  - If LongOrderSysID is 0, OrderSysID can be used for cancelling orders
- If OrderGroupID is not 0, OrderRef can be used for cancelling orders

7.1.2.2. Multi-order cancellation

Multi-order cancellation can help to cancel up to 16 orders each time, its characteristics are similar to Multi-Orders.

```
virtual bool cancelMultiOrders(unsigned count,YDCancelOrder cancelOrders[],const YDExchange *exchanges[],const YDAccount *pAccount=NULL)
```

The parameters of the above method are described as follows:

Parameter	Description
unsigned count	Count of orders to be cancelled: 16 at most
YDCancelOrder cancelOrders[]	Order cancellation information arrays corresponding to exchange pointer arrays
YDExchange *exchanges[]	Exchange pointer array corresponding to each order cancellation information
YDAccount	The given "NULL" means that the current API login account is used

7.1.2.3. Order cancellation notification

If orders are cancelled successfully, the latest statuses of those cancelled orders will be sent back through notifyOrder, please refer to Order Notification for details.

If the order cancellation fails, a notification will be sent back through the following callback regardless of the cancellation caused by the OMS rejection or the exchange rejection. Just check the ErrorNo of the YDFailedCancelOrder to obtain the reason for the cancellation failure. Generally, this error is made in that the orders have been traded or cancelled.**Please note that YD cannot ensure a strict correspondence between a cancellation failure notification and an investors' cancellation instruction in terms of volume and content. It is strongly suggested that investors only use the cancellation failure notifications for logging. The trading strategy should not be dependent on cancellation failure notifications but should establish a timeout mechanism after cancellation instructions are sent. If no any notification on the corresponding change of order status is received within a set period of time, a new cancellation instruction should be sent**

```
virtual void notifyFailedCancelOrder(const YDFailedCancelOrder *pFailedCancelOrder,const YDExchange
*pExchange,const YDAccount *pAccount) {}
```

The parameters of the above method are described as follows:

Parameter	Field	Description
YDCancelOrder	AccountRef	Account reference No.
	ExchangeRef	Exchange reference No.
	YDOrderFlag	Type of order corresponding to cancellation error
	OrderSysID	Exchange order ID No.
	LongOrderSysID	Full-accuracy exchange order ID No.
	OrderGroupID	Order logic group ID
	OrderRef	Investor's order reference No.
	ErrorNo	Error No.
	IsQuote	Is it a notification for quote cancellation
YDExchange		Exchange with order cancellation error
YDAccount		Account for order cancellation error

Generally, the information sent back due to order cancellation failure corresponds to the method used for cancellation, namely:

- Filling in OrderSysID/LongOrderSysID and OrderGroupID/OrderRef is meaningless in notifications regarding order cancellation through OrderSysID and LongOrderSysID.
- Filling in OrderGroupID/OrderRef and OrderSysID/LongOrderSysID is meaningless in notifications regarding order cancellation through OrderGroupID and OrderRef.

However, under the following circumstances, the notification on failure of order cancellation using OrderGroupID and OrderRef is different from that mentioned above:

- Notifications on cancellation failures sent by exchanges will not be forwarded to investors.
- When an order notification has been sent back and errors such as flow control or network disconnection occur during cancellation, the OrderSysID and LongOrderSysID will be filled out in the order cancellation failure notification.

Therefore, when receiving a cancellation failure notification, the notified information should be checked. If OrderGroupID is 0, the corresponding order can be found through OrderSysID or LongOrderSysID; If OrderGroupID is not 0, the corresponding order can be found through OrderGroupID and OrderRef.

Generally, investors use OrderRef to establish an order index. When receiving a cancellation error notification with filled out OrderSysID and LongOrderSysID, the following method can be used to obtain the corresponding OrderRef and OrderGroupID:

```
virtual const YDExtendedOrder *getOrder(int orderSysID,const YDExchange *pExchange,int
YDOrderFlag=YD_YOF_Normal)
virtual const YDExtendedOrder *getOrder(long long longOrderSysID,const YDExchange *pExchange,int
YDOrderFlag=YD_YOF_Normal)
```

7.1.3. Covered operation

7.1.3.1. Spot freezing and unfreezing

Before covered stock option operation and normal-to-covered conversion of SSE, the spot positions should be locked first. When SZSE carries out a covered operation, its trading system is subject to an internal freezing operation, so the covered operation can be carried out directly without freezing in advance.

The freezing and unfreezing operations should be initiated to exchanges through the insertOrder instruction according to the following parameter description.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_FreezeUnderlying, indicating that the order is subject to a spot freezing operation
	OrderRef	Customer order reference No., see the description of OrderRef in Normal Order for details
	Direction	YD_D_Freeze: Freeze YD_D_Unfreeze: Unfreeze
	OrderVolume	For providing the volume to be frozen and unfrozen
	HedgeFlag	For filling in YD_HF_Covered
YDInstrument		For specifying a spot instrument pointer to be frozen or unfrozen
YDAccount		The given "NULL" means that the current API login account is used

7.1.3.2. Covered open and close

The open and close operations should be initiated to exchanges through the "insertOrder" instruction according to the following parameter description.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_Normal
	OrderRef	Customer order reference No., see the description of OrderRef in Normal Order for details
	Direction	YD_D_Buy: Buy YD_D_Sell: Sell
	OffsetFlag	YD_OF_Open: Open YD_OF_Close: Close
	HedgeFlag	For filling in YD_HF_Covered
	OrderType	For providing the following values as needed: YD_ODT_Limit: Price-limited Order YD_ODT_Market: Market Price Order YD_ODT_FOK: FOK Order
	Price	For providing a price
	OrderVolume	Volume for open and close
YDInstrument		For specifying an option instrument pointer for covered position opening and closing
YDAccount		The given "NULL" means that the current API login account is used

7.1.3.3. Normal-to-covered conversion

The normal-to-covered or covered-to-normal conversion operation should be initiated to exchanges through the insertOrder instruction according to the following parameter description. It should be noted that both SSE and the SZSE support normal-to-covered conversion, but only SZSE supports covered-to-normal conversion.

Parameter	Field	Description

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_Cover
	OrderRef	Customer order reference No., see the description of OrderRef in Normal Order for details
	Direction	YD_D_Normal2Covered: Normal-to-covered YD_D_Covered2Normal: Covered-to-normal, only supported by SZSE
	HedgeFlag	For filling in YD_HF_Covered
	OrderVolume	Volume to be converted
YDInstrument		For specifying an option instrument pointer to be converted
YDAccount		The given "NULL" means that the current API login account is used

7.1.4. RFQ

For SHFE, INE, CFFEX, DCE, CZCE and GFEX, the RFQ should be sent through insertOrder according to the following parameter description. The RFQ must be made to an instrument allowing the request, otherwise it will be meaningless.

> The SHFE and INE allow RFQ to be involved in the message count calculation. In order to prevent investors from unexpectedly exceeding the message count limit and being charged a high commission, YD provided Message Count Risk Control. When the message count triggers the upper threshold set by the Message Count Risk Control, investors will be prohibited from trading, including RFQ.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_RequestForQuote
	Direction	For filling in YD_D_Buy
	OffsetFlag	For filling in YD_OF_Open
	HedgeFlag	For filling in YD_HF_Speculation
	OrderType	For filling in YD_ODT_Limit
YDInstrument		For specifying an instrument pointer for RFQ
YDAccount		The given "NULL" means that the current API login account is used

Even if an OMS notification YD_AF_NotifyOrderAccept function has been set for the AccountFlag of YDAccount, no OMS notification regarding the RFQ instruction will be sent.

The RFQ notification notifyRequestForQuote is only sent by the market maker system (a MarketMaker flag is included in the OMS authorization file) in order to prevent those unnecessary data, and ordinary systems cannot receive RFQ notifications.

```
virtual void notifyRequestForQuote(const YDRequestForQuote *pRequestForQuote,const YDInstrument *pInstrument)
```

The following shows a description of the information sent back from notifyRequestForQuote.

Parameter	Field	Description
YDRequestForQuote	RequestTime	Second counts from the beginning (17:00) to the RFQ time of a trading day. For example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between the integral time and reference time, see string2TimeID and timeID2String of ydUtil.h
	RequestForQuoteID	RFQ ID number. If being too long, the number length sent back will be truncated
	LongRequestForQuoteID	Full-accuracy RFQ ID number
YDInstrument		RFQ instrument pointer

In ydExtendedApi, YD provides a method for actively querying RFQ ID numbers as shown below:

```
virtual const YDExtendedRequestForQuote *getRequestForQuote(const YDInstrument *pInstrument)
```

The return value YDExtendedRequestForQuote of the above method is a subclass of YDRequestForQuote, so the RequestTime and RequestForQuoteID can be read directly. If no quote is found after a query, the operation of the above method will go back to NULL.

7.1.5. Quote

YD supports the market maker quote operation of SHFE, INE, CFFEX, DCE, GFEX, CZCE, SSE and SZSE. The quote instructions can only be used through YD OMSs with the market maker function enabled (a MarketMaker flag is included in the OMS authorization file). The current OMS can be checked for supporting the quote function depending on the MarketMaker flag of SystemParam. Please refer to System Parameter for details.

7.1.5.1. Normal quote

Market makers can send single quotes according to the following method. If a "False" is sent back through this function, it means that the network to the OMS has been interrupted.

```
virtual bool insertQuote(YDInputQuote *pInputQuote,const YDInstrument *pInstrument,const YDAccount
*pAccount=NULL)
```

The parameters of the above method are described as follows:

Parameter	Field	Description
YDInputQuote	OrderRef	Customer order reference No., see the description of OrderRef in Normal Order for details
	BidOffsetFlag	Bid offset flag
	BidHedgeFlag	Bid hedge flag CFFEX: Actually, the exchange interface only supports the same hedge flag on both sides, which will not be checked by YD, however when submitting orders to the exchange, the customer ID number corresponding to the buyer's hedge flag should be used. Other exchanges: The buyer's and seller's hedge flags can be different
	AskOffsetFlag	Ask offset flag
	AskHedgeFlag	Ask hedge flag
	BidPrice	Bid price. The buying price must be lower than the selling price
	AskPrice	Ask price
	BidVolume	Bid volume. Depending on YDExchange.QuoteVolumeRestriction, different trade volume limits are provided: 0 (DCE and GFEX): At least one of BidVolume and AskVolume is higher than 0, and the other is higher than or equal to 0 1 (CFFEX, SSE, SZSE): BidVolume and AskVolume must be higher than 0, however they can be different 2 (SHFE, INE, CZCE): BidVolume and AskVolume must be equal and higher than 0
	AskVolume	Ask volume
	OrderRef	Customer's order reference No.
	YDQuoteFlag	Quote flag, This field is a bitmap that can simultaneously set multiple flags. YD_YQF_ResponseOfRFQ: For automatically filling in the RFQ number to indicate the response price. It is supported by SHFE, INE, DCE, GFEX and CZCE. Other exchanges do not provide RFQ numbers. YD_YQF_ReplaceLastQuote：Whether or not to top the last sent quote is only effective for CFFEX.
YDInstrument		For specifying an instrument pointer to be quoted
YDAccount		The given "NULL" means that the current API login account is used

After initiating a quote request, in order to unify the quote operation of all exchanges, the YD OMS will generate corresponding orders for the quote. The YDOrderFlag of these orders is YD_YOF_QuoteDerived: If involving a two-side quote, two derived orders will be generated; If involving a one-side quote, only one derived order will be generated. Derived orders only exist in YD and will not be sent to exchanges. The traded quotes and order statuses will be shown on the derived orders, while the quotes themselves are provided without any status information. The relationship between the derived order fields YDOrder and quote YDQuote fields is as follows:

- The directions of derived buy/sell orders correspond to YD_D_Buy and YD_D_Sell, respectively
- The OffsetFlag of derived buy/sell orders corresponds to BidOffsetFlag and AskOffsetFlag, respectively
- The HedgeFlag of derived buy/sell orders corresponds to BidHedgeFlag and AskHedgeFlag, respectively
- The prices of derived buy/sell orders correspond to BidPrice and AskPrice, respectively
- The OrderVolume of derived buy/sell orders corresponds to BidVolume and AskVolume, respectively
- The OrderRef of derived buy/sell orders refers to the OrderRef of quotes
- The YDOrderFlag of derived buy/sell orders refers to YD_YOF_QuoteDerived
- The OrderLocalID of derived buy/sell orders is numbered according to the normal order sequence. The OrderLocalID of derived sell orders must be the OrderLocalID+1 of buy orders
- The OrderSysID of derived buy/sell orders correspond to BidOrderSysID and AskOrderSysID, respectively

7.1.5.2. Multi-quote

The multi-quote operation can involve no more than 12 quotes each time, and its characteristics are similar to Multi-Orders.

```
virtual bool insertMultiQuotes(unsigned count,YDInputQuote inputQuotes[],const YDInstrument *instruments[],const YDAccount *pAccount=NULL)
```

The parameters of the above method are described as follows:

Parameter	Description
unsigned count	Count of quotes: 12 at most
YDInputQuote inputQuotes[]	Order arrays corresponding to instrument pointer arrays
const YDInstrument *instruments[]	Exchange point array corresponding to each quote
YDAccount	The given "NULL" means that the current API login account is used

7.1.5.3. Quote notification

All true or false exchange quote notifications will be sent back through notifyQuote. After receiving a notification, if YDQuote.ErrorNo is 0, it will be process as a true one; If YDQuote.ErrorNo is not 0, it will be processed as false one.

If the quote is made successfully, a notification will be received through the following callback functions, where:

- notifyQuote: Each quote corresponds only one notification, indicating that the exchange has received the quote request, and its position among notifyOrder callbacks is not ensured;
- notifyOrder: This callback will be received when the status of a derived order changes, and its status machine is the same as that for normal orders;
- notifyTrade: The quote is the same as that for a normal order. A trade notification will be generated when a quote is accepted successfully. It can be associated with a derived order through OrderLocalID, or with a quote through OrderSysID.

```
virtual void notifyQuote(const YDQuote *pQuote,const YDInstrument *pInstrument,const YDAccount *pAccount) {}
virtual void notifyOrder(const YDOrder *pOrder,const YDInstrument *pInstrument,const YDAccount *pAccount) {}
virtual void notifyTrade(const YDTrade *pTrade,const YDInstrument *pInstrument,const YDAccount *pAccount) {}
```

Similar to Order Notification, the order of 'notifyQuote' and 'notifyOrder' depends on the specific behavior of the exchange. For example, after receiving a bilateral quote, CFFEX first sends the 'notifyQuote' for the quote and then sends the 'notifyOrder' for the two derivative orders. On the other hand, SHFE first sends the 'notifyOrder' for the two derivative orders and then sends the 'notifyQuote' for the quote. The exchange does not promise or guarantee any behavior regarding quote feedback, and reserves the right to change such behavior at any time. Therefore, when developing strategy programs, investors should not rely on the exchange's feedback behavior and instead ensure that they can handle it correctly regardless of the order in which they receive any type of feedback.

Among them, notifyOrder and notifyTrade are the same as normal orders. The YDQuote of notifyQuote is a subclass of YDInputQuote. In addition to the regular RealConnectionID and ErrorNo, the new information for YDQuote is as follows:

Parameter	Field	Description
YDQuote	QuoteSysID	If ErrorNo is YD_ERROR_InvalidGroupOrderRef, it means that the maximum OrderRef has been received by current OMS; Otherwise, it means a quote number for quote cancellation. If the return value of the exchange is too long, it will be truncated.
	BidOrderSysID	The OrderSysID of the bid quote, which is 0 when selling a one-side quote. If the return value of the exchange is too long, it will be truncated.
	AskOrderSysID	The OrderSysID of the ask quote, which is 0 when buying a one-side quote. If the return value of the exchange is too long, it will be truncated.
	RequestForQuoteID	When YDQuoteFlag is YD_YQF_ResponseOfRFQ, the order response RFQ number will be recorded, otherwise will be 0. If the return value of the exchange is too long, it will be truncated.
	LongQuoteSysID	Full-accuracy quote number for quote cancellation
	LongBidOrderSysID	The OrderSysID of a full-accuracy bid quote, which will be 0 when selling a one-side quote
	LongAskOrderSysID	The OrderSysID of a full-accuracy ask quote, which will be 0 when buying a one-side quote
	LongRequestForQuoteID	Full-accuracy. When YDQuoteFlag is YD_YQF_ResponseOfRFQ, the full-accuracy order response RFQ number will be recorded, otherwise will be 0
YDInstrument		Quote instrument pointer
YDAccount		current API login account pointer

7.1.5.4. Extended quote notificatio

If YDExtendedListener is used by investors, notifications can be received through notifyExtendedQuote under the following circumstances:

- In case of a notifyOrder callback, regardless of true or false quotes and regardless of orders rejected by the OMS or an exchange
- In case of an attribute change of YDExtendedQuote
- In case of a successful order submission and sending through checkAndInsertQuote

```
virtual void notifyExtendedQuote(const YDExtendedQuote *pQuote)
```

Since YDExtendedQuote comes from YDQuote, exclusive fields of YDExtendedQuote are:

Field	Description
BidOrderFinished	For determining whether a derived order corresponding to a buy leg has been finished When the derived order is cancelled, completed or rejected, it is considered finished If the quote bid volume is 0, it will be directly considered finished
AskOrderFinished	For determining whether a derived order corresponding to a sell leg has been finished When the derived order is cancelled, completed or rejected, it is considered finished If the quote ask volume is 0, it will be directly considered finished
m_pInstrument	Quote instrument pointer
m_pAccount	Investor pointer to which the quote belongs

7.1.6. Quote cancellation

Investors can call the following method to cancel unhandled quotes.

```
virtual bool cancelQuote(YDCancelQuote *pCancelQuote,const YDExchange *pExchange,const YDAccount *pAccount=NULL)
virtual bool cancelMultiQuotes(unsigned count,YDCancelQuote cancelQuotes[],const YDExchange *exchanges[],const YDAccount *pAccount=NULL)
```

CFFEX, DCE, GFEX, SSE and SZSE (rather than SHFE, INE and CZCE) support one-side cancellation of two-side quotes through cancelling derived orders. The method for cancelling a derived order is the same as that for a normal order. Refer to Order Cancellation for the corresponding details. Just like those mentioned for quote cancellation, when cancelling a derived order, only the order callback notifyOrder is allowed, and no quote callback notifyQuote is provided.

7.1.6.1. Normal quote cancellation

The following method can be used for cancelling single quotes. If a "False" is sent back through this function, it means that the network to an OMS has been interrupted.

```
virtual bool cancelQuote(YDCancelQuote *pCancelQuote,const YDExchange *pExchange,const YDAccount *pAccount=NULL)
```

The parameters of the above method are described as follows:

Parameter	Field	Description
YDCancelQuote	QuoteSysID	Exchange quote number
	LongQuoteSysID	Full-accuracy exchange quote number
	OrderGroupID	For specifying the logical group to which the quote belongs, which can be used together with OrderRef for quote cancellation through OrderRef
	OrderRef	For using together with OrderGroupID for quote cancellation through OrderRef
YDExchange		Exchange pointer for quotes to be cancelled
YDAccount		The given "NULL" means that the current API login account is used

The OMSs support three quote cancellation modes, including LongOrderSysID, OrderSysID, and OrderRef. The OrderRef order cancellation mode allows investors to cancel orders before receiving notifications. Currently, it is supported by CFFEX, SHFE, INE, DCE, SSE and SZSE. The logic of the cancellation mode is as follows:

- First, judge the value of OrderGroupID. If OrderGroupID is 0, then continue to evaluate the value of LongQuoteSysID. Otherwise, proceed with the logic for non-zero OrderGroupID.
  - If LongQuoteSysID is not 0, the LongQuoteSysID can be used for cancelling quotes
  - If LongQuoteSysID is 0, OuoteSysID can be used for cancelling quotes
- If OrderGroupID is not 0, OrderRef can be used for cancelling quotes

7.1.6.2. Multi-quote cancellation

Multi-quote cancellation can help to cancel up to 16 orders each time, its characteristics are similar to Multi-Orders.

```
virtual bool cancelMultiQuotes(unsigned count,YDCancelQuote cancelQuotes[],const YDExchange *exchanges[],const YDAccount *pAccount=NULL)
```

The parameters of the above method are described as follows:

Parameter	Description
unsigned count	Count of quotes to be cancelled: 16 at most
YDCancelQuote cancelQuotes[]	Quote cancellation information arrays corresponding to exchange pointer arrays
YDExchange *exchanges[]	Exchange pointer array corresponding to each quote cancellation information
YDAccount	The given "NULL" means that the current API login account is used

7.1.6.3. Quote cancellation notification

If quotes are cancelled successfully, the status of each derived order will be sent back through the notifyOrder callback. Please note that **there will not** be a notifyQuote callback when a quote is cancelled.

```
virtual void notifyOrder(const YDOrder *pOrder,const YDInstrument *pInstrument,const YDAccount *pAccount) {}
```

If the quote cancellation fails, the error information will be sent back through notifyFailedCancelOrder callback. At this time, the ErrorNo of YDQuote should be checked for error reasons. **Please note that YD cannot ensure a strict correspondence between a quote cancellation failure notification and an investors' cancellation instruction in terms of volume and content. It is strongly suggested that investors only use the quote cancellation failure notifications for logging. The trading strategy should not be dependent on quote cancellation failure notifications but should establish a timeout mechanism after cancellation instructions are sent. If no**

any notification on the corresponding change of quote status is received within a set period of time, a new quote cancellation instruction should be sent

```
virtual void notifyFailedCancelQuote(const YDFailedCancelQuote *pFailedCancelQuote,const YDExchange *pExchange,const YDAccount *pAccount)
```

The parameters of the above method are described as follows:

Parameter	Field	Description
YDCancelQuote	AccountRef	Account reference No.
	ExchangeRef	Exchange reference No.
	QuoteSysID	Exchange quote number
	LongQuoteSysID	Full-accuracy exchange quote number
	OrderGroupID	Order logic group ID
	OrderRef	Investor's order reference No.
	ErrorNo	Error No.
	IsQuote	Is it a notification for quote cancellation
YDExchange		Exchange with order cancellation error
YDAccount		Account for order cancellation error

Generally, the information sent back due to quote cancellation failure corresponds to the method used for quote cancellation, namely:

- Filling in QuoteSysID/LongQuoteSysID and OrderGroupID/ OrderRef is meaningless in notifications regarding quote cancellation through OrderSysID and LongOrderSysID
- Filling in OrderGroupID/OrderRef and QuoteSysID/LongQuoteSysID is meaningless in notifications regarding quote cancellation through OrderGroupID and OrderRef

However, under the following circumstances, the notification on failure of quote cancellation using OrderGroupID and OrderRef is different from that mentioned above:

- Notifications on quote cancellation failures sent by exchanges will not be forwarded to investors
- When an order notification has been sent back and errors such as flow control or network disconnection occur during quote cancellation, the QuoteSysID and LongQuoteSysID will be filled out in the quote cancellation failure notification

Therefore, when receiving a quote cancellation failure notification, the notified information should be checked. If OrderGroupID is 0, the corresponding order can be found through QuoteSysID or LongQuoteSysID; If OrderGroupID is not 0, the corresponding order can be found through OrderGroupID and OrderRef.

Generally, investors use OrderRef to establish an order index. When receiving a quote cancellation error notification with filled out QuoteSysID and LongQuoteSysID, the following method can be used to obtain the corresponding OrderRef and OrderGroupID:

```
virtual const YDExtendedQuote *getQuote(int quoteSysID,const YDExchange *pExchange)=0;
virtual const YDExtendedQuote *getQuote(long long longQuoteSysID,const YDExchange *pExchange)=0;
```

7.1.7. Alternate quotes

SHFE, INE, DCE, CZCE, CFFEX, SSE and SZSE support alternate quote operations (quoted order for cancellation), namely a new quote under the same instrument can be made for replacing the previous one in order to reduce cancellations.

> In CTP, SHFE and INE do not perform position verification when closing out a position. For example, a market maker has a position of 10 lots in a particular instrument. In the scenario where there is already an outstanding bid order to close 8 lots, the market maker can directly place a bid order to close 8 lots, achieving the effect of replacing the previous bid order. However, due to the lack of support for position verification exemption in closing out orders on other exchanges within CTP, YD does not provide special handling for position verification exemption in closing out orders on SHFE and INE. This is not conducive to market maker's unified order code. Therefore, YD does not support the excess position replacing order functionality on all exchanges. Please note that when the sum of the quantity in the outstanding quote orders and the quantity in the replacing orders is less than the total position, the submission of replacing orders is always allowed. For example, a market maker has a position of 10 lots in a particular instrument. In the scenario where there is

> already an outstanding bid order to close 4 lots, the market maker can directly place a bid order to close 4 lots, achieving the effect of replacing the previous bid order.

When selecting the alternate quote operation, the investors can directly submit a new quote according to the common quotation method. The callback means the notification generated for one order cancellation and one quotation. Therefore, refer to Quote and Quote cancellation for the relevant details.

CFFEX supports multi-level quoting, which means participants can submit quotes at multiple price levels. Therefore, CFFEX supports three options for replacing orders: not replacing, replacing with the last order, and replacing with a specified order.Given that other exchanges have not implemented multi-level quoting and specified replacing order functionality, the YD system offers only two choices: no replacement and replacement with a new order. When quoting, if the 'YDQuote.YDQuoteFlag' is set with the 'YD_YQF_ReplaceLastQuote' flag, it indicates replacing the last order; If not set, it indicates no replacement, which means multiple-level quoting will be generated. Previous quote orders can only be canceled by specifying cancellation, and cannot be replaced through the submission of a new order.

7.1.8. Combination and decombination

DCE, GFEX, SSE and SZSE do not have provide large-side margin operations and only provide deducted margin services relying on traditional combined positions. CZCE provides both one-way large-side margin operations (under the same instrument) and deducted margin services relying on traditional combined positions.

For DCE and GFEX, positions can be combined automatically and traditionally for settlement, so they are combined before opening. If there are new positions that meet the definition of traditional combined positions and need to be combined during trading, a combination instruction can be used for combination. When closing positions, the DCE and GFEX can perform decombination automatically, and therefore no advanced decombination is needed.

For CZCE, positions can be combined automatically for covered call operation before settlement, and other operation types are allowed depending on a successful application. Therefore, positions that have been covered and successfully applied for before opening will be combined and the margin will be automatically deducted according to the offset (larger side under the same instrument) during trading. When closing, CZCE supports automatic decombination, and therefore no advanced decombination is needed.

For SSE and SZSE, automatic combination is not allowed for settlement unless combination instructions are used during trading. In SSE and SZSE, positions must be decombined before closing. Combined positions are not allowed for closing.

YD provides three different methods for sending combination instructions, which are:

- Native instruction: ydApi and ydExtendedApi users can call insertCombPositionOrder to send native combination and decombination instructions, while ydExtendedApi users can call checkAndInsertCombPositionOrder to send native combination and decombination instructions;
- Auto instruction: ydExtendedApi users can call autoCreateCombPosition to send an automatic combination instruction;
- Auto tool: For using the auto combination tool ydAutoCP to regularly send a combination instruction, which can be downloaded from Here or obtained from a broker.

7.1.8.1. Native instruction

ydApi and ydExtendedApi users can call insertCombPositionOrder to send native combination and decombination instructions, while ydExtendedApi users can call checkAndInsertCombPositionOrder to send native combination and decombination instructions. Compared to other combination methods, the native instruction is the freest, because it allows investors to choose instructions for combination without priority constraints. Native instruction is also the only one that support decombination. At the same time, the auto instruction and auto tool are developed based on the native instruction.

```
1 virtual bool insertCombPositionOrder(YDInputOrder *pInputOrder,const YDCombPositionDef *pCombPositionDef,const
  YDAccount *pAccount=NULL)
2 virtual bool checkAndInsertCombPositionOrder(YDInputOrder *pInputOrder,const YDCombPositionDef
  *pCombPositionDef,const YDAccount *pAccount=NULL)
```

The parameters of checkAndInsertCombPositionOrder and insertCombPositionOrder are similar, the difference is that checkAndInsertCombPositionOrder should be subject to a validity check for input parameters at the API end compared to insertCombPositionOrder. If the validity check fails, a "False" will be directly sent back through checkAndInsertCombPositionOrder. The error reasons can be obtained via ErrorNo of YDInputOrder instead of the OMS's check, these validity checks are:

- Checking the validity of trading direction, hedge flag and combination quantity values
- Checking if there are sufficient positions for combination and if there are sufficient traditional combined positions for decombination

API local validity checks can help to save the time for sending notification due to invalid fields, but an overhead to each combination instruction will be added. However, combination instructions are not sensitive to performance, so it is suggested that all ydExtendedApi users who want to use the native instruction send combination instructions through checkAndInsertCombPositionOrder.

The calling method for insertCombPositionOrder and checkAndInsertCombPositionOrder is shown below.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_CombPosition
	OrderRef	Customer order reference No., refer to Normal Order for more details about the description of OrderRef.
	Direction	YD_D_Make: Combine YD_D_Split: Decombine
	OrderType	0
	HedgeFlag	For filling in YD_HF_Speculation
	OrderVolume	Volume required for combination or decombination. When combining, the volume for the two legs' traditional uncombined positions should be higher than that for combination. When decombining, the volume for traditional combined positions should be higher than that for decombination.
	CombPositionDetailID	Combination details ID. Only required for decombination in SSE and SZSE. For other circumstances, it should be 0.
YDCombPositionDef		Traditional combined position definition pointer for pending combinations, refer to Traditional combined Position Definition for details.
YDAccount		The given "NULL" means that the current API login account is used

After a combination is made or fails, the investors will be notified through the following callback interface.

```
virtual void notifyCombPositionOrder(const YDOrder *pOrder,const YDCombPositionDef *pCombPositionDef,const YDAccount *pAccount) {}
```

7.1.8.1.1. Extended combination notification

If using YDExtendedListener, investors can receive detailed combination notifications through notifyExchangeCombPositionDetail under the following circumstances:

- When receiving detailed preday combination information, refer to traditional combined preday position for more details
- When a detailed combination changes due to a successful combination or unfreezing instruction operation

```
virtual void notifyExchangeCombPositionDetail(const YDExtendedCombPositionDetail *pCombPositionDetail)
```

For the structure of YDExtendedCombPositionDetail, refer to traditional combined preday position.

7.1.8.2. Auto instruction

For ydExtendedApi users, in most cases, the function of autoCreateCombPosition can be called to automatically complete combinations. Currently, the auto instruction is only supported by DCE and GFEX. For SSE and SZSE, decombination is required first for position closing, and the native instruction must be used for decombination. Therefore, for the combination and decombination in SSE and SZSE, the native instruction should be used directly.

```
virtual const YDCombPositionDef *autoCreateCombPosition(const int *combTypes)
```

When the autoCreateCombPosition is called each time, the positions that can be combined can be checked one by one according to the combination type sequence specified by combTypes, and under the same combination type, to the priority sequence specified by YDCombPositionDef.Priority (the lower the value, the higher the priority). Once the positions that can be combined are found, a combination instruction will be sent to the OMS. Please note at most one combination is allowed each time when the autoCreateCombPosition is called. In production, a separate thread can be used to continuously call this function at a certain gap. If the positions to be combined are found and

sent successfully, the corresponding traditional combined position definition will be sent back through this function. If the positions to be combined are not found, a "NULL" will be sent back through the function.

The calling method for autoCreateCombPosition is shown below.

Parameter	Description
const int* combTypes	The type array to be involved in a combination, ended with -1. The combination should be conducted according to the array sequence and types one by one. When it is NULL, the sequence of all traditional combined position types of DCE is adopted by default, namely, from YD_CPT_DCE_FuturesOffset to YD_CPT_DCE_SellOptionsCovered

After a combination is made or fails, the investors will be notified through the following callback interface.

```
virtual void notifyCombPositionOrder(const YDOrder *pOrder,const YDCombPositionDef *pCombPositionDef,const YDAccount *pAccount) {}
```

7.1.8.3. Auto tool

YD provided an independent auto combination tool namely ydAutoCP for investors early on. This tool can be started up through command lines, and after startup, it, at a certain gap, can be used for searching for positions that can be combined and send combination instructions. Due to many restrictions and inconvenience in using ydAutoCP, it is suggested that investors use APIs to send combination instructions. For the same reason as that for automatic instructions, ydAutoCP only supports the automatic combination of DCE.

The example configuration file ydACP.ini for ydAutoCP is as follows:

```
AppID=yd_dev_1.0
AuthCode=ecbf8f06469eba63956b79705d95a603

AccountID=001
Password=001

# time ranges for auto combine position , can be multiple, no such setting indicates selecting at any time. Default is no setting
TimeRange=21:00:05-23:29:55
TimeRange=09:00:05-10:14:55
TimeRange=10:30:05-11:29:55
TimeRange=13:30:05-15:29:55

# refresh period, in seconds, default is 10, must be greater than 1
RefreshPeriod=10

# directory to hold log files, default is "ACPLog"
LogDir=ACPLog

# Comb positions types to be processed. If not given, default is all types. Optional values are as follow:
# YD_CPT_DCE_FuturesOffset=0
# YD_CPT_DCE_OptionsOffset=1
# YD_CPT_DCE_FuturesCalendarSpread=2
# YD_CPT_DCE_FuturesProductSpread=3
# YD_CPT_DCE_BuyOptionsVerticalSpread=4
# YD_CPT_DCE_SellOptionsVerticalSpread=5
# YD_CPT_DCE_OptionsStraddle=7
# YD_CPT_DCE_OptionsStrangle=8
# YD_CPT_DCE_BuyOptionsCovered=9
# YD_CPT_DCE_SellOptionsCovered=10
CombPositionType=0,1,2,3,4,5,7,8,9,10
```

Except a few obvious parameters, the core parameters are described as follows:

- The TimeRange can help to specify the system running time. Because ydAutoCP will disable traditional combination position definitions from being involved in the subsequent combinations in case of a combination error and sending traditional combination orders during non-trading hours will result in that all combination position definitions be disabled during this period of time, when configuring the system, the non-trading hours of exchanges must be avoided. At the same time, the operating system running ydAutoCP must be properly timed.

- The meaning of the parameter combTypes for CombPositionType and autoCreateCombPosition is the same. Please refer to Auto Instruction for the relevant details.

The startup method of ydAutoCP is the following, where config.txt is the configuration file of YD API, and the configuration file ydACP.ini of ydAutoCP is loaded by default, so the file name cannot be modified:

```
./ydAutoCP config.txt
```

Once a traditional combination position definition is disabled in the system, the ydAutoCP must be restarted if a revalidation of this definition is expected. The disabled traditional combination position definition can be checked in the log. The following shows an example about error messages:

```
error in handling (pg2302&-eg2303,1) for account 12345678
```

7.1.9. Option offset

For SHFE and INE, the volume of positions to be offset can be specified. Option offset initiation and cancellation requests should be sent to exchanges through the insertOrder instruction according to the following method. SHFE and INE have set different default offset values for different investors: For common investors, their option positions are not offset by default and they can apply for or give up applying for offset; For market makers, their option positions are offset by default, and they can apply for non-offset or give up applying for non-offset. For the same investor, instrument and OrderType, only the most recent application records can be kept.

For the current operation of the YD system, the futures positions obtained by the SHFE and INE are self-offsetting, which is fixed in the exercise instructions sent to exchanges and currently cannot be modified.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_OptionSelfClose
	OrderRef	Customer order reference No., see the description of OrderRef in Normal Order for details
	OrderType	YD_ODT_CloseSelfOptionPosition: Requesting offset options for common investors YD_ODT_ReserveOptionPosition: Requesting non-offset options for market makers YD_ODT_SellCloseSelfFuturesPosition: Requesting offset futures positions after performance of put options
	HedgeFlag	Hedge flag YD_HF_Speculation=1: Speculation YD_HF_Hedge=3: Hedge
	OrderVolume	>0: Initiating and specifying the request volume 0: Cancelling the corresponding request (under the same investor, instrument and OrderType)
YDInstrument		For specifying an option instrument pointer to be offset
YDAccount		The given "NULL" means that the current API login account is used

For DCE and GFEX, it is not possible to specify the volume of positions to be offset. For the current operation of the YD system, the futures positions obtained DCE and GFEX through excercise are self-offsetting, which is fixed in the exercise instructions sent to exchanges and currently cannot be modified.

The initiation and cancellation of an option offset request can be sent to an exchange through the insertOrder instruction according to the following method.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_Mark
	OrderRef	Always 0 The OrderRef in the notification is always -1, which cannot correspond to the OrderRef in the request
	Direction	: Initiating an offset request YD_D_Sell: Cancelling an offset request
	OrderType	YD_ODT_PositionOffsetMark: Position offset YD_ODT_CloseFuturesPositionMark: Offset performance, effective across days

Parameter	Field	Description
	HedgeFlag	Hedge flag YD_HF_Speculation=1: Speculation YD_HF_Hedge=3: Hedge
YDInstrument		Specified instrument pointer to be offset in case of a position offset Specified any instrument pointer of the corresponding exchange in case of an offset performance
YDAccount		The given "NULL" means that the current API login account is used

Considering the particularity of offset instructions in DCE and GFEX, YD cannot correlate requests and notifications sent to exchanges. Upon receiving a notification from an exchange, YD will generate a special notification. Therefore, after sending offset instructions from DCE and GFEX, investors should not keep the orders at the client or wait for a matching notification, but instead confirm the operations and check them for being handled according to the corresponding instrument, the exchange to which the instrument belongs, the OrderType and OrderStatus after receiving an order notification indicating that YDOrderFlag is YD_YOF_Mark. For the same reason as above, even if the AccountFlag of YDAccount is set with the OMS notification YD_AF_NotifyOrderAccept, the offset instructions of DCE and GFEX also do not mean sending the OMS notifications".

Please note that the offset performance of DCE and GFEX is set at the account level, namely, as long as an offset performance request is submitted, all options for the account will be offset after performance. For the sake of simplifying the API, when initiating an offset performance instruction, an instrument belonging to DCE or GFEX should be specified, so that the YD OMSs can help to find the exchange through which to send the offset performance instruction. In the notification for the exchange, no any specific instrument will be included. Therefore, YD will transfer the first instrument of the corresponding exchange back with the notification, for investors, just obtain the exchange of the instrument.

Please that the offset instructions of DCE and GFEX do not point to any connection order, the YD trading system will take them as sent from the chief connection. Because such orders are not provided with system order reference numbers or local order reference numbers, it is impossible to use any mechanism to identify repeated receiving. If the full-management connection plus full-flow receiving mode is used, the notification will be received by all connections, which will make YD OMS generate uncorrelated order notifications. Therefore, sending and receiving through the chief connection should be adopted. However, this also poses a problem. If the chief connection is not public, the instruction will not be sent to investors who cannot use the chief connection. Therefore, for DCE and GFEX, the chief connection should not be configured as an exclusive one.

The following table describes the assignment of notifications received through notifyOrder:

Parameter	Field	Description
YDOrder	YDOrderFlag	YD_YOF_Mark
	Direction	YD_D_Buy: Initiating an offset request YD_D_Sell: Cancelling an offset request
	OrderType	YD_ODT_PositionOffsetMark: Position offset YD_ODT_CloseFuturesPositionMark: Offset performance
	HedgeFlag	Hedge flag YD_HF_Speculation=1: Speculation YD_HF_Hedge=3: Hedge
	OrderRef	-1
	OrderLocalID	-1
	OrderSysID	0
	InsertTime	-1
	OrderStatus	Traded: YD_OS_AllTraded Rejected: YD_OS_Rejected
	ErrorNo	0 should be assigned when traded, and the exchange error number should be used when an error is caused
YDInstrument		The specified instrument pointer in the notification in case of a position offset The first instrument of the corresponding exchange sent back in case of an offset performance

Parameter	Field	Description
YDAccount		Current API login account

CFFEX and CZCE do not provide option offset services

7.1.10. Option exercise

For the American options of SHFE, INE, DCE, CZCE and GFEX as well as the options of SSE and SZSE, the insertOrder can be used for initiating an exercise application to exchanges, and the cancelOrder can be used for cancelling an exercise application. The exercise instructions for American options of SHFE, INE, DCE, CZCE and GFEX can be sent on any trading day. The exercise instructions of SSE and SZSE must be sent on the exercise day.

For the sake of easy programming, YD provides parameterized representations for supporting option exercise or not. The YDExchange.OptionExecutionSupport is used for supporting option exercise at different levels:

- 0: Not supported. It is applicable to CFFEX now.
- 1: Supported, excluding risk control. The so-called "Excluding Risk Control" means excluding money position check and freezing. It is unapplicable to any exchange now.
- 2: Supported, including risk control. The so-called "Risk Control" means money position check and freezing. It is applicable to SHFE, INE, DCE, CZCE, GFEX, SSE and SZSE now.

The following describes how to provide parameters for option exercise.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_OptionExecute
	OrderRef	Customer order reference No., refer to Normal Order for more details about the description of OrderRef
	Direction	For filling in YD_D_Sell
	OffsetFlag	For filling in the OffsetFlag of the position corresponding to the exercise For SHFE and INE, just fill in YD_OF_CloseToday or YD_OF_CloseYesterday For other exchanges, just fill in YD_OF_Close
	OrderType	For filling in YD_ODT_Limit
	HedgeFlag	Hedge flag. The definition is different for futures exchanges and stock option exchanges. For futures exchanges: YD_HF_Speculation=1: Speculation YD_HF_Hedge=3: Hedge For stock option exchanges: YD_HF_Normal=1: Normal YD_HF_Covered=3: Covered
	OrderVolume	For specifying the volume for exercise
YDInstrument		For specifying the instrument pointer for options to be exercised
YDAccount		The given "NULL" means that the current API login account is used

CFFEX does not support exercise instructions and can automatically exercise all In-the-Money options on the last trading day. If no exercise is needed, just close the positions before the last trading day.

For SSE and SZSE, combined exercises can be initiated to exchanges through insertOptionExecTogetherOrder or checkAndInsertOptionExecTogetherOrder instructions according to the following method. The exercise request can be cancelled through cancelOrder. When combining exercises, two option instruments should be specified, which must meet the following conditions:

- The underlying securities of option instruments should be the same, for example, an SSE - SZSE 300ETF option instrument and an SSE 50ETF option instrument cannot be submitted together
- The exercise price of a put option on a trading day must be higher than the call option and must be subject to an option instrument expiring on the very day
- The instrument units must be the same. The underlying dividends, etc., may lead to adjustments in the instrument for ETF options, which may result in different instrument units for standard instruments and non-standard instruments (instruments with non-M codes).

However, such non-standard instruments and standard instruments cannot be submitted together.

- The volume of call/put options to be exercised shall not exceed the net volume of the corresponding instrument-based long positions held by investors. The volume of net positions of a trading day should be determined after the termination of the combination strategy at the very day. If exceeding the currently available exercise limit, the submitted volume will be invalid.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_OptionExecuteTogether
	OrderRef	Customer order reference No., refer to Normal Order for more details about the description of OrderRef
	OrderVolume	For specifying the volume for combined exercise.
YDInstrument	pInstrument	For specifying the pointer of option instrument for combined exercise
	pInstrument2	For specifying the pointer of option instrument for combined exercise
YDAccount		The given "NULL" means that the current API login account is used

7.1.11. Abandonment of option exercise

For SHFE, INE and CZCE, according to the following description, the insertOrder can be used for initiating an exercise abandonment application to exchanges and the cancelOrder can be used for cancelling an exercise abandonment application. The exercise abandonment instructions must be sent on the last trading day of American options or the option exercise day of European options. On the above trading days, if no any exercise abandonment application is made, the in-the-money options will be exercised automatically by exchanges.

For the sake of easy programming, YD provides parameterized representations for supporting option exercise abandonment or not. The YDExchange.OptionAbandonExecutionSupport is used for supporting option exercise at different levels:

- 0: Not supported. It is applicable to CFFEX, SSE, SZSE, DCE and GFEX now. CFFEX, SSE and SZSE do not support option exercise abandonment instruction. DCE and GFEX support abandoning option exercises through YD_YOF_Mark rather than YD_YOF_OptionAbandonExecute, refer to the following content for details.
- 1: Supported, excluding risk control. The so-called "Excluding Risk Control" means excluding money position check and freezing. It is unapplicable to any exchange now.
- 2: Supported, including risk control. The so-called "Risk Control" means money position check and freezing. It is applicable to SHFE, INE and CZCE now.

The following describes how to provide parameters for option exercise abandonment.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_OptionAbandonExecute
	OrderRef	Customer order reference No., refer to Normal Order for details about the description of OrderRef
	Direction	For filling in YD_D_Sell
	OffsetFlag	For filling in the OffsetFlag of the position corresponding to the exercise For SHFE and INE, just fill in YD_OF_CloseToday or YD_OF_CloseYesterday For other exchanges, just fill in YD_OF_Close
	OrderType	For filling in YD_ODT_Limit
	HedgeFlag	Hedge flag. The definition is different for futures exchanges and stock option exchanges. For futures exchanges: YD_HF_Speculation=1: Speculation YD_HF_Hedge=3: Hedge For stock option exchanges: YD_HF_Normal=1: Normal YD_HF_Covered=3: Covered
	OrderVolume	For specifying the volume for exercise
YDInstrument		For specifying the instrument pointer for options to be exercised
YDAccount		The given "NULL" means that the current API login account is used

For DCE and GFEX, The setting for abandoning automatic exercise applies to the instrument. Once successful in abandoning exercise, all positions of that instrument will not be subject to automatic exercise. Please refer to the following instructions for using 'insertOrder' to initiate a request to abandon exercise or cancel the corresponding exercise request with the exchange. The exercise abandonment instructions must be sent on the last trading day of American options or the option exercise day of European options. On the above trading days, if no any exercise abandonment application is made, the options will be exercised automatically.

Parameter	Field	Description
YDInputOrder	YDOrderFlag	For filling in YD_YOF_Mark
	OrderRef	Customer order reference number Due to the lack of order-related fields in the upward and downward interfaces for exercise abandonment in DCE and CZCE, YD is unable to associate the exchange feedback of exercise abandonment with the corresponding investor order. As a result, the OrderRef sent by the counterparty is always -1, which cannot correspond to the OrderRef in the request
	Direction	YD_D_Buy: Requesting automatic exercise on expiry date YD_D_Sell: Cancelling the corresponding request
	OrderType	For filling in YD_ODT_OptionAbandonExecuteMark
	HedgeFlag	Hedge flag YD_HF_Speculation=1: Speculation YD_HF_Hedge=3: Hedge
YDInstrument		For specifying an option instrument pointer for automatic exercise abandonment
YDAccount		The given "NULL" means that the current API login account is used

For SSE and SZSE, there is no corresponding exercise abandonment instructions. If no any exercise instruction is sent on the last trading day of American options or the exercise day of European options, the exercise will be abandoned by default.

For CFSE, exercise abandonment instructions are not supported. If no exercise is needed, just close the positions before the last trading day.

7.1.12. Unsupported services

YD aims to support the services needed by investors as much as possible while maintaining the performance. Considering the performance and the actual needs of investors using YD products, YD OMSs have not yet supported the following.

Exchange	Unsupported service
SHFE and INE	Settlement price trade TAS instruction

If you have actual needs for the above services, just contact YD through a broker. If the needs are indeed universal, YD will try its best to help you.

7.2. Trading restrictions

7.2.1. Trading right

Considering the appropriate requirements of risk management and investors, brokers should set trading rights at the investor, exchange, product and instrument levels; Investors also have a risk control need to proactively set some instrument trading rights. Therefore, YD provides four trading right setting sources to meet different risk control setting requirements:

- Permanent rights set by administrators: Permanently valid after setting. Only administrators rather than investors are allowed for this source setting.
- Permanent rights set by investors: Permanently valid after setting. Both administrators and investors are allowed for the setting.
- Temporary rights set by administrators: Valid for the current trading day after setting. Only administrators rather than investors are allowed for this source setting. Currently, they are set after the after-trade risk control rules are triggered to ensure that the after-trade risk control rules are only valid on the current trading day.
- Temporary rights set by investors: Valid for the current trading day after setting. Both administrators and investors are allowed for the setting.

> Order cancellation is always allowed regardless of the trading rights of instruments.

Although YD allows the separate setting of trading right sources, an investor's rights on an instrument is the result after summarizing the above four sources. The method for investors to set trading rights is as follows:

```
virtual bool setTradingRight(const YDAccount *pAccount,const YDInstrument *pInstrument,const YDProduct *pProduct,const YDExchange *pExchange, int tradingRight,int requestID=0,int tradingRightSource=YD_TRS_AdminPermanent)
```

The parameters involved in the above method are described as follows:

Parameter	Description
pAccount	Account pointer. The account pointer of the current investor can be obtained through getMyAccount.
pInstrument	Instrument pointer, indicating the right to set an instrument. Please set pProduct and pExchange to NULL at this time
pProduct	Product pointer, indicating the right to set a product. Please set pInstrument and pExchange to NULL at this time
pExchange	Exchange pointer, indicating the right to set an exchange. Please set pProduct and pInstrument to NULL at this time
tradingRight	Rights that should be set, including: YD_TR_Allow=0: Allowing all trades, which is the most relaxed setting. YD_TR_CloseOnly=1: Only position closing is allowed. YD_TR_Forbidden=2: No trades are allowed, which is the most stringent setting.
requestID	For distinguishing between different setting requests, which is usually set to 0. The requestID of a request can be received through notifyResponse.
tradingRightSource	Trading right setting sources YD_TRS_AdminPermanent=0: Permanent rights set by an administrator YD_TRS_UserPermanent=1: Permanent rights set by an investors YD_TRS_AdminTemp=2: Temporary rights set by an administrator YD_TRS_UserTemp=3: Temporary rights set by an investor

The ultimate rights of an investor in a specific instrument depends on the exchange to which the instrument belongs, the product to which the instrument belongs, and the most stringent settings of the instrument. The pseudocodes are expressed as follows:

```
int getInstrumentTradingRight(YDApi *api, YDInstrument *instrument)
{
    accountInfo=api->getMyAccount();
    accountExchangeInfo=api->getAccountExchangeInfo(instrument->m_pExchange);
    accountProductInfo=api->getAccountProductInfo(instrument->m_pProduct);
    accountInstrumentInfo=api->getAccountInstrumentInfo(instrument);

    accountInfo->TradingRight = max(
        accountInfo->TradingRightFromSource[YD_TRS_AdminPermanent],
        accountInfo->TradingRightFromSource[YD_TRS_UserPermanent],
        accountInfo->TradingRightFromSource[YD_TRS_AdminTemp],
        accountInfo->TradingRightFromSource[YD_TRS_UserTemp]
    );

    accountExchangeInfo->TradingRight = max(
        accountExchangeInfo->TradingRightFromSource[YD_TRS_AdminPermanent],
        accountExchangeInfo->TradingRightFromSource[YD_TRS_UserPermanent],
        accountExchangeInfo->TradingRightFromSource[YD_TRS_AdminTemp],
        accountExchangeInfo->TradingRightFromSource[YD_TRS_UserTemp]
    );

    accountProductInfo->TradingRight = max(
        accountProductInfo->TradingRightFromSource[YD_TRS_AdminPermanent],
        accountProductInfo->TradingRightFromSource[YD_TRS_UserPermanent],
        accountProductInfo->TradingRightFromSource[YD_TRS_AdminTemp],
        accountProductInfo->TradingRightFromSource[YD_TRS_UserTemp]
    );
```

```
    accountInstrumentInfo->TradingRight = max(
        accountInstrumentInfo->TradingRightFromSource[YD_TRS_AdminPermanent],
        accountInstrumentInfo->TradingRightFromSource[YD_TRS_UserPermanent],
        accountInstrumentInfo->TradingRightFromSource[YD_TRS_AdminTemp],
        accountInstrumentInfo->TradingRightFromSource[YD_TRS_UserTemp]
    );

    return max(
        accountInfo->TradingRight,
        accountExchangeInfo->TradingRight,
        accountProductInfo->TradingRight,
        accountInstrumentInfo->TradingRight
    );
}
```

If a trading right changes during trading, it is usually caused by the administrator's active setting or an after-trade risk control trigger. The right change notification can be obtained through the following callback functions. When receiving any of the following three callbacks, the pseudocode function getInstrumentTradingRight above should be used to obtain the trading rights for the involved instrument:

```
virtual void notifyAccount(const YDAccount *pAccount)
virtual void notifyAccountExchangeInfo(const YDAccountExchangeInfo *pAccountExchangeInfo)
virtual void notifyAccountProductInfo(const YDAccountProductInfo *pAccountProductInfo)
virtual void notifyAccountInstrumentInfo(const YDAccountInstrumentInfo *pAccountInstrumentInfo)
```

If closing positions based on an instrument that does not have trading rights, an error order notification notifyOrder or an error quote notification notifyQuote will be received, their ErrorNo is YD_ERROR_NoTradingRight=10.

The trading rights of a combined instrument does not mean using the rights set in the combined instrument, but separately determining whether the rights set in the two-leg instrument of the combined instrument meet the trading requirements. Assuming that the left and right legs of a combined instrument are Instrument A and B, depending on the rights set by investors in the two instruments, the trades under different combined instruments are as follows:

- If Instrument A and B allow trades, all trades under the combined instrument will be allowed.
- If Instrument A allows trades, and Instrument B allows only position closing, the trades can only be allowed when the two legs of the combined instrument are closed at the same time, or the left leg is opened and the right leg is closed.
- If Instrument A and B only allow position closing, then the trades can only be allowed when the two legs of the combined instrument are opened at the same time.
- If Instrument A allows trades, and Instrument B does not, all trades under this combined instrument will be not allowed.

7.2.2. Order count limitation

By default, a YD OMS is not used for controlling the count of investors' orders. However, considering the upper limit of the YD OMS's memory databases, if one of the databases reaches the upper limit, the entire YD OMS will be unavailable. In order to avoid a sudden increase of the trade volume caused by abnormal trades of some investors from affecting other customers at the OMS, brokers can set a limit on the order count for each investor. The order count is controlled by the fund account. If an investor establishes more than one connection, the trade volume of all connections can be calculated in summary. The order counts of investors can only be increased when normal orders and notifications are sent to and received from exchanges, respectively. Quotes, cancelled orders, derived orders, and OMS sent error orders are not included in the order count.

> For the current version, the upper limit for internal database orders / trades and quotes at OMSs are 16.77 million and 8.38 million, respectively. If the transaction changes and normal transaction requires more space, YD can expand the capacity at any time.

The order count limit can be found through YDAccount.MaxOrderCount. If the value is -1, it means no limit, which is made by default.

For investors using ydExtendedApi, the total order count for the current account can be queried through YDExtendedAccount.UsedOrderCount. If an investor has established more than one connection through the fund account, the YDExtendedAccount.UserdOrderCount will contain the number of reports for all connections.

After the investor makes the order count reach the upper limit of the account, for the next order, a YD_ERROR_TooManyOrders=36 error will be sent back through notifyOrder. In order to prevent the OMS space from being occupied by excessive and abnormal orders, if the investor keeps conducting the order operation, the orders will be directly discarded by the OMS without sending back any error notification. The YD_ERROR_TooManyOrders=36 error must be checked, and the order logic must be stopped or adjusted after receiving the error notificaiton. If you have any questions, just contact the broker.

If the OMS memory database resources are exhausted, investors will receive a YD_ERROR_MemoryExceed=7 error for any order through notifyOrder.

7.2.3. Login count limit

By default, the count of login connections for a fund account is not limited by YD OMSs, and investors can log in to YD OMSs unlimitedly with one account. However, excessive connections may cause the TCP down-bound thread to always be busy issuing the down-bound flow, which is unfavorable to the efficient operation of YD OMSs. In order to avoid affecting the performance of the OMSs due to excessive connections, brokers can set a login count limit for each investor.

The total login count can be shown through YDAccount.MaxLoginCount. If this value is -1, it means no limit, which is made by default. The current login count can be shown through YDAccount.LoginCount.

After an investor makes the order count reach the upper limit for his account, a YD_ERROR_TooManyRequests=20 error will be sent back through notifyLogin when logging in to the account next time.

For more information about multiple connections, refer to Multiple Connections for more details.

7.2.4. Self-trade check

In order to avoid being restricted from trading by exchanges due to investors' self-trades, YD OMSs are provide with a self-trade check function. YD's self-trade check function has been optimized, so it is unnecessary to disable the trade check function due to performance concerns.

This function is enabled by default. If an investor has already performed a check in the strategy program, he/she can ask a broker to help disable the self-trade check function under his account. The investor can check the YDAccount.AccountFlag for a set YD_AF_DisableSelfTradeCheck flag. If yes, it means that the self-trade check function under this account has been disabled.

The exchanges specify that a self-trade can be only made when the price of a price-limited order overlaps with that of a pending price-limited order. Therefore, market price orders, FAK orders and FOK orders are not involved in YD's self-trade check logic. If the trading prices of a price-limited order and the existing pending order do not overlap, they will not be considered as self-traded. For example, under an instrument, if a sell order price is CNY 10, and the quote of a buy order is CNY 11 at this time, it will be considered as a self-trade by the system, while if the quote of the buy order is CNY 9, it will not be considered as a self-trade.

SHFE, INE, DCE, CZCE, and CZEX are exempt from self-matching during the pre-opening session. As a result, orders placed by the aforementioned exchanges during the pre-opening session will not be identified as self-trades by the YD OMSs.

> If the error of "1138 order triggered self-trade" is encountered during the trading in CFFEX, it means that the broker has enabled the "Self-trade prevention function" applied for to CFFEX. This function can be used to check whether there is a price overlap between a FAK/FOK order and a price-limited order under the same trading code. If there is an overlap, it will be intercepted by the exchange. The self-trade prevention function is provided by CFFEX to brokers. After being enabled, it can be used for all trading codes of brokers and cannot be set separately for investors. Although the self-trade prevention behavior of FAK/FOK orders can be intercepted through the self-trade prevention function, it does not mean that the self-trades caused by FAK/FOK orders can be determined as the self-trade behavior by the regulatory department of CFFEX. For the Measures for Administration of Abnormal Trades in Financial Futures Exchanges of China, it is clearly stated in the relevant regulatory standard and processing program for stock index options that when counting customer's self-trades, frequent order submissions / cancellations and large-volume order submissions / cancellations, the self-trade behavior caused by all real-time trades or price-limited cancellation instructions, real-time remaining price-limited cancellation instructions and market price orders are excluded in the self-trade count.

Although some exchanges grant investors a certain amount of self-trade exemption, considering that the self-trade check is conducted based on investors' trading codes, if the trading code of an investor causes a self-trade due to trading via different brokers, it will also be included in a self-trade by exchanges, and the control of such self-trade is relatively difficult. Considering protecting investors' interests, in order to leave the exemption for uncontrollable self-trades under the same trading code during trading via different brokers, YD OMSs do not allow any potential self-trade orders, and all behaviors detected and considered by the system as potential self-trades will be directly rejected by OMSs.

If any order is considered as involved in a self-trade, a YD_ERROR_PossibleSelfTrade=25 error will be sent back through notifyOrde.

7.2.5. Monotonic increase check of order reference number

In previous API versions, there were no increase requirements for OrderRef for up-bound instructions such as orders and quotes, and investors could set OrderRef as needed. During the production, the UDP interfaces of YD OMSs have ever received a large number of repeated orders due to network reasons, affecting investors trades.

In order to avoid such problems, it is suggested that investors use non-zero order groups to submit orders and avoid repeated orders through the check function. Refer to Order Group for details.

> In previous API versions, in order to solve the above problems, YD has enabled the order reference number check function for each new account on the management ends by default. The OMSs could be used to check whether the OrderRef of investors with this function enabled is monotonically increasing. If a non-monotonic increase order is received through OrderRef, an error with the ErrorNo being YD_ERROR_InvalidOrderRef=78 will be sent back.
>
> The scope of monotonic increase check for order reference numbers is limited to API instances, namely, orders submitted under the same API instance require a monotonic increase, but no restrictions are made for the OrderRef of orders among different API instances created under the same account. Therefore, under multiple connections, using the last few digits of the OrderRef as the SessionID is still valid. Raw protocol orders are checked as one separate source and do not conflict with API's UDP orders. If an OMS is restarted (e.g. starting day trading) while the client is not restarted because of the enabled HA, the order reference number can start from the beginning.
>
> Investors can check the YD_AF_OrderRefCheck flag for having been set for YDAccount.AccountFlag to make sure that this function has been enabled. If this flag is set, it means that the monotonic increase check function for order reference numbers has been enabled.
>
> In order to avoid unnecessary repeated checks, it is suggested that investors disable the above-mentioned order reference number check function when conducting order operations through non-zero order groups. If an investor still conducts order operations through an order group with the reference number being 0 and does not want the order reference number check to affect the coding logic of the existing OrderRef, he/she can also ask the broker to turn off the order check On/Off under his/her account.

7.3. Trading information query

ydApi cannot be used for storing flows, so the following query function can only be used under ydExtendedApi.

Query statements are subject to slow calling and should not be called under trading threads. Frequent query statement calling is not suggested for fear of system lagging.

7.3.1. Order query

```
/// getOrder by orderSysID can only be used for orders have been accepted by exchange
virtual const YDExtendedOrder *getOrder(int orderSysID,const YDExchange *pExchange,int YDOrderFlag=YD_YOF_Normal)
virtual const YDExtendedOrder *getOrder(long long longOrderSysID,const YDExchange *pExchange,int YDOrderFlag=YD_YOF_Normal)
```

The above method can be used to query **orders with received notifications from exchanges** or quote derived orders. All orders submitted through the insertOrder series order submission method can be queried through this function. By default, normal orders can be queried, and other types of orders can be queried by setting the YDOrderFlag.

```
/// getOrder by orderRef can only be used for orders using checkAndInsertOrder
virtual const YDExtendedOrder *getOrder(int orderRef,unsigned orderGroupID=0,const YDAccount *pAccount=NULL)=0;

/// getQuoteDerivedOrder can only be used for orders derived oder by using checkAndInsertQuote
virtual const YDExtendedOrder *getQuoteDerivedOrder(int orderRef,int direction,unsigned orderGroupID=0,const YDAccount *pAccount=NULL)=0;
```

Orders submitted using checkAndInsertOrder of ydExtendedApi can be queried through the above two methods. As long as checkAndInsertOrder and checkAndInsertQuote calls are completed, they can be queried through these two methods without receiving any exchange's notification. Among them, getOrder can be used to query orders except those quote derived ones, while getQuoteDerivedOrder can be used to query quote derived orders. Compared to getOrder, order direction parameters are added to make a distinction between derived buy and sell orders under two-side quotations.

```
/// orders must have spaces of count, return real number of orders(may be greater than count). Only partial will be set if no enough space. Only orders accepted by exchange can be found in this function
virtual unsigned findOrders(const YDOrderFilter *pFilter,unsigned count,const YDExtendedOrder *orders[])=0;

/// User should call destroy method of return object to free memory after using following method
virtual YDQueryResult<YDExtendedOrder> *findOrders(const YDOrderFilter *pFilter)=0;
```

YD provides the above-mentioned two methods for multi-query of **orders with received notifications from exchanges**. Their query criteria are used in the same way. The pseudo code logic for determining whether a certain order meets the query criteria is as follows:

```
if YDOrder.OrderSysID < 0
    return false

if YDOrder.YDOrderFlag not in YDOrderFilter.YDOrderFlags
    return false

if YDOrderFilter.StartTime >= 0 and YDOrder.InsertTime > YDOrderFilter.StartTime
    return false

if YDOrderFilter.EndTime >= 0 and YDOrder.InsertTime < YDOrderFilter.EndTime
    return false

if YDOrderFilter.pExchange != NULL and YDOrderFilter.pExchange != YDOrder.pExchange
    return false

if YDOrder.YDOrderFlag ==  YD_YOF_CombPosition
    if YDOrderFilter.pCombPositionDef != NULL and YDOrderFilter.pCombPositionDef != YDOrder.pCombPositionDef
        return false
else
    if YDOrderFilter.pInstrument != NULL and YDOrderFilter.pInstrument != YDOrder.pInstrument
        return false
    if YDOrderFilter.pProduct != NULL and YDOrderFilter.pProduct != YDOrder.pProduct
        return false
return true
```

Each field to be filled out is described as follows:

Parameter	Field	Description
YDOrderFilter	StartTime	The start time in the form of TimeID. -1 means unlimited. See the following example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between TimeID and reference time, see string2TimeID and timeID2String of ydUtil.h
	EndTime	The end time in the form of TimeID. -1 means unlimited. See the following example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between TimeID and reference time, see string2TimeID and timeID2String of ydUtil.h
	YDOrderFlags	For setting the flag bits of YDOrderFlag to query. More than one flag bit can be set. For example, when querying normal and combined orders, the following expression setting can be used: 1<<YD_YOF_Normal | 1<<YD_YOF_CombPosition
	pCombPositionDef	Definition traditional combined positions. For YD_YOF_CombPosition orders, only this parameter and pExchange can be checked. When set to NULL, it means that no limit will be made.
	pInstrument	Instrument pointer. It is valid for non-YD_YOF_CombPosition orders. When set to NULL, it means that no limit will be made.
	pProduct	Product pointer. It is valid for non-YD_YOF_CombPosition orders. When set to NULL, it means that no limit will be made.
	pExchange	Exchange pointer. When set to NULL, it means that no limit will be made.
	pAccount	The "Investor" should always be set to NULL

The first method requires investors to allocate a fixed-length YDExtendedOrder pointer array in advance. If the pre-allocated length is not enough for the space, only the pre-allocated array length orders can be filled out. Whether the pre-allocated length is enough or not for the space, the return values regarding this method are the total orders meeting the query criteria. Investors, relying on this, can call findOrders(pFilter, 0, NULL) to quickly obtain the total orders meeting the criteria.

- The advantage of this method is that when there are not many orders and the length of the pre-allocated array is enough, the pre-allocated pointer array can be reused without allocating for each query;
- The disadvantage of this method is that if there are many orders, it may need to be called twice (the first time aims to obtain the total orders, the second time, to allocate the array that can include all orders before calling again) to fully obtain all orders meeting the criteria.

The second method can help investors allocate a space for all orders meeting the criteria. However, the allocated space, after being used, should be destroyed by investors actively by calling YDQueryResult.destory(). Compared with the first method:

- The advantage of this method is that all orders can be notified by one call
- The disadvantage of this method is that the investors need to actively release the space allocated according to this method, and each call will lead to the allocation of a new space, however, frequent allocation and release are very unfriendly to the cache.

7.3.2. Trade query

```
/// trades must have spaces of count, return real number of trades(may be greater than count). Only partial will be set if no enough space
virtual unsigned findTrades(const YDTradeFilter *pFilter,unsigned count,const YDExtendedTrade *trades[])=0;

/// User should call destroy method of return object to free memory after using following method
virtual YDQueryResult<YDExtendedTrade> *findTrades(const YDTradeFilter *pFilter)=0;
```

The method for multi-query of trades is similar to that of Order Query. Please refer to Order Query for the details. The pseudocode logic for determining whether a trade meets the query criteria is as follows:

```
if YDTradeFilter.StartTime >= 0 and YDTrade.InsertTime > YDTradeFilter.StartTime
    return false

if YDTradeFilter.EndTime >= 0 and YDTrade.InsertTime < YDTradeFilter.EndTime
    return false

if YDTradeFilter.pInstrument != NULL and YDTradeFilter.pInstrument != YDTrade.pInstrument
    return false

if YDTradeFilter.pProduct != NULL and YDTradeFilter.pProduct != YDTrade.pProduct
    return false

if YDTradeFilter.pExchange != NULL and YDTradeFilter.pExchange != YDTrade.pExchange
    return false

return true
```

Each field to be filled out is described as follows:

Parameter	Field	Description
YDTradeFilter	StartTime	The start time in the form of TimeID. -1 means unlimited. See the following example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between TimeID and reference time, see string2TimeID and timeID2String of ydUtil.h
	EndTime	The end time in the form of TimeID. -1 means unlimited. See the following example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between TimeID and reference time, see string2TimeID and timeID2String of ydUtil.h
	pInstrument	Instrument pointer. When set to NULL, it means that no limit will be made.
	pProduct	Product pointer. When set to NULL, it means that no limit will be made.

Parameter	Field	Description
	pExchange	Exchange pointer. When set to NULL, it means that no limit will be made.
	pAccount	The "Investor" should always be set to NULL

7.3.3. Quote query

```
/// getQuote by quoteSysID can only be used for quotes have been accepted by exchange
virtual const YDExtendedQuote *getQuote(int quoteSysID,const YDExchange *pExchange)
virtual const YDExtendedQuote *getQuote(long long longQuoteSysID,const YDExchange *pExchange)
```

The above method can be used to query **quotes with received notifications from exchanges**. All quotes submitted through the insertQuote series quote operation method can be queried through this function.

```
/// getQuote by orderRef can only be used for quotes using checkAndInsertQuote
virtual const YDExtendedQuote *getQuote(int orderRef,unsigned orderGroupID=0,const YDAccount *pAccount=NULL)=0;
```

Quotes submitted using checkAndInsertQuote of ydExtendedApi can be queried through the above method. As long as checkAndInsertQuote calls are completed, they can be queried through these two methods without receiving any exchange's notification.

```
/// quotes must have spaces of count, return real number of quotes(may be greater than count). Only partial will be set if no enough space. Only quotes accepted by exchange can be found in this function
virtual unsigned findQuotes(const YDQuoteFilter *pFilter,unsigned count,const YDExtendedQuote *quotes[])=0;

/// User should call destroy method of return object to free memory after using following method
virtual YDQueryResult<YDExtendedQuote> *findQuotes(const YDQuoteFilter *pFilter)=0;
```

The method for multi-query of quotes is similar to that of Order Query. Refer to Order Query for the details. The pseudocode logic for determining whether a quote meets the query criteria is as follows:

```
if YDQuote.OrderSysID < 0
    return false

if YDQuoteFilter.StartTime >= 0 and (any DerivedOrder of YDQuote).InsertTime > YDQuoteFilter.StartTime
    return false

if YDQuoteFilter.EndTime >= 0 and (any DerivedOrder of YDQuote).InsertTime < YDQuoteFilter.EndTime
    return false

if YDQuoteFilter.pInstrument != NULL and YDQuoteFilter.pInstrument != YDQuote.pInstrument
    return false

if YDQuoteFilter.pProduct != NULL and YDQuoteFilter.pProduct != YDQuote.pProduct
    return false

if YDQuoteFilter.pExchange != NULL and YDQuoteFilter.pExchange != YDQuote.pExchange
    return false

return true
```

Each field to be filled out is described as follows:

Parameter	Field	Description
YDTradeFilter	StartTime	The start time in the form of TimeID. -1 means unlimited. Any derived order of a quote that is later than the start time can be considered as valid. See the following example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between TimeID and reference time, see string2TimeID and timeID2String of ydUtil.h

Parameter	Field	Description
	EndTime	The end time in the form of TimeID. -1 means unlimited. Any derived order of a quote that is earlier than the start time can be considered as valid. See the following example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between TimeID and reference time, see string2TimeID and timeID2String of ydUtil.h
	pInstrument	Instrument pointer. When set to NULL, it means that no limit will be made.
	pProduct	Product pointer. When set to NULL, it means that no limit will be made.
	pExchange	Exchange pointer. When set to NULL, it means that no limit will be made.
	pAccount	The "Investor" should always be set to NULL

7.4. Trading segment

YD supports sending summarized and detailed trading segment announcements:

- Summarized trading segment announcements are those showing continuous information about trading segments. In order to reduce the communication traffic and the impact on API, summarized trading segment announcements only show the different time points for changing status announced by client exchanges. If several events occur at the same time, only the first one will be sent, namely for events occurred at the same time, only the first one will be pushed.
- Detailed trading segment announcements are those that are not sent by default. Trading segment announcements of some exchanges are made based on instruments, so a large number of announcements can be sent to all investors at the same time, which can cause Internet congestion if some notifications regarding orders are sent at this time. Therefore, detailed trading segment announcements should be used prudently. Once this function is enabled, all investors using the same OMS will receive detailed trading segment announcements. This function can be checked for being enabled at an OMS through TradingSegmentDetail of SystemParam. Refer to System Parameters for details.

7.4.1. Summarized trading segment

The summarized trading segment information can be sent back through the following callback function. The segmentTime means the count of seconds from the beginning of a trading day to that time. For its coding method, refer to Order Notification for more details about the relevant description for InsertTime.

```
1 virtual void notifyTradingSegment(const YDExchange *pExchange, int segmentTime)
```

The following shows different time points for changing trading statuses of current exchanges, which are only used for reference. The exchanges are subject to change without notice. The actual receiving time points during production shall prevail.

Exchange	Day trading hours	*Night trading hours
CFFEX	09:25:00 09:29:00 09:30:00 11:30:00 13:00:00 14:57:00 15:00:00 15:15:00	
INE	09:00:00 10:15:00 10:30:00 11:30:00 13:30:00 15:00:00	20:55:00 20:59:00 21:00:00 23:00:00 01:00:00 02:30:00

Exchange	Day trading hours	*Night trading hours
SHFE	08:55:00 08:59:00 09:00:00 10:15:00 10:30:00 11:30:00 13:30:00 15:00:00	 20:55:00 20:59:00 21:00:00 23:00:00 01:00:00 02:30:00
DCE	08:54:50 08:55:00 08:58:50 08:59:00 08:59:50 09:00:00 10:14:50 10:15:00 10:29:50 10:30:00 11:29:50 11:30:00 13:29:50 13:30:00 14:59:50 15:00:00	 20:54:50 20:55:00 20:58:50 20:59:00 20:59:50 21:00:00 22:59:50 23:00:00

7.4.2. Detailed trading segment

The detailed trading segment information can be sent back through the following callback function. The dimensions of the returned trading stages may vary among different exchanges, possibly returning the detailed trading segments based on the dimensions of exchange, product, or instrument. The detailed trading segments will be notified to investors after the "notifyFinishInit" function, but investors should not assume that all statuses of exchanges, products, or instruments can be collected before the "notifyCaughtUp" function. Some detailed trading segments may be received after the "notifyCaughtUp" function. Therefore, the strategy program should consider the trading segment of a instrument as non-trading until receiving the corresponding notification of the detailed trading segments. OMS will ensure that the trading status of all instruments will be correctly sent, regardless of whether the OMS has been restarted during market hours.

> The reasons for not being able to receive all the details before notifyCaughtUp can be primarily attributed to two factors. Firstly, it could be because the market is currently in a pre-trading phase, and the exchange has not yet pushed any detailed transaction segments. Secondly, it is because of the way the OMS sends transactions, if there are updated detailed transaction segments during the process of sending transactions, the older versions of those segments will be skipped. If the segment number of a new version of a detailed transaction is greater than the maximum order number at the time of API login, then the record of that detailed transaction segment will be sent after the function of notifyCaughtUp.

```
virtual void notifyTradingSegmentDetail(const YDTradingSegmentDetail *pTradingSegmentDetail)
```

The fields of YDTradingSegmentDetail sent back are described below.

Field	Description
ExchangeRef	Exchange reference No. It is helpful when the detailed trading segment information relating to an exchange is sent back, otherwise it will be -1.
ProductRef	Product reference No. It is helpful when the detailed trading segment information relating to a product is sent back, otherwise it will be -1.
InstrumentRef	Instrument reference No. It is helpful when the detailed trading segment information relating to an instrument is sent back, otherwise it will be -1.
m_pExchange	Exchange pointer. It is helpful when the detailed trading segment information relating to an exchange is sent back, otherwise it will be NULL.

Field	Description
m_pProduct	Product pointer. It is helpful when the detailed trading segment information relating to a product is sent back, otherwise it will be NULL.
m_pInstrument	Instrument pointer. It is helpful when the detailed trading segment information relating to an instrument is sent back, otherwise it will be NULL.
SegmentTime	The count of seconds from the beginning of a trading day to that time. For its coding method, see the relevant description for InsertTime in Order Notification.
TradingStatus	Trading segment status: YD_TS_NoTrading: Non-Trading YD_TS_Continuous: Continuous trading YD_TS_Auction: Call auction

7.5. Order group

In order to better support investors' need for making a distinction between orders and monotonic increase check of order reference numbers, YD has added an order group function in Vers. '1.280'. Investors can set OrderGroupID and GroupOrderRefControl in YDInputOrder and YDInputQuote to use the order group function.

Field	Description
OrderGroupID	For specifying the logical group to which orders and quotes belong, which can be used to determine the strategy, connection, and other logical groups to which the orders belong. Investors can use Order Groups 0-63. To ensure the compatibility, for Order Group 0, the monotonic increase of OrderRef will not be checked, while for Order Group 1-63, the OrderRef monotonicity will be checked according to the settings
GroupOrderRefControl	For specifying the method required by investors for checking the monotonic increase of order orderRef at the OMSs: YD_GORF_Increase: Monotonic increase of OrderRef. The gap between two OrderRef numbers must be higher than or equal to 1 YD_GORF_IncreaseOne: The OrderRef numbers should be strictly monotonically increased, and the gap between two OrderRef numbers must be 1

After specifying OrderGroupID and GroupOrderRefControl for an order and a quote, the OMS will check the monotonicity of the order group to which the order belongs. If the check fails, an ErrorNo=YD_ERROR_InvalidGroupOrderRef error order will be sent back through notifyOrder, and the current maximum OrderRef of OrderGroupID will be set in the MaxOrderRef notification. Whether the order is handled or not, the OrderGroupID and GroupOrderRefControl set for YDInputOrder and YDInputQuote will be sent back through YDOrder and YDQuote.

Specifying OrderGroupID and GroupOrderRefControl on each order is a great help for investors' easy operation. For orders with the same OrderGroupID, investors can set YD_GORF_Increase for the first one to enable the monotonic increase check function and YD_GORF_IncreaseOne for the second one to enable the stringent monotonic increase check function.

After the callback function notifyLogin for successful login for the first time or successful reconnection/login after disconnection, the OMS will send back the current maximum OrderRef for each OrderGroupID through the following callback function. Please be sure to record the return values in relation to this callback and use OrderRef numbers that meet the increase specification for subsequent orders.

```
virtual void notifyGroupMaxOrderRef(const int groupMaxOrderRef[])
```

For investors using ydExtendedApi, the following method can be used to directly obtain the next OrderRef for orders or quotes:

```
virtual int getNextOrderRef(unsigned orderGroupID=0,bool update=true)=0;
```

orderGroupID specifies the order group numbers. If orderGroupID is set to 0, the next OrderRef rules can be set, see Multiple Connections; If orderGroupID is set to 1 to 63, the next OrderRef must be the current maximum OrderRef plus 1.

The "update" indicates whether the maximum order reference number of the order group needs to be updated after obtaining the next OrderRef. Assuming that the next OrderRef sent back after calling getNextOrderRef is n, if the "update" for this call is "True", the next OrderRef sent back after calling getNextOrderRef next time will be n+1; If the "update" for this call is "False", the next OrderRef sent back after calling getNextOrderRef next time will still be n.

7.6. Multiple connections

By default, YD OMSs support multiple API instance connections to OMSs at the same time under the same fund account in addition to unlimited connections. A broker can control the maximum login connections for each investor at the OMS end. Investors can query whether the broker has set up an upper limit of connections through MaxLoginCount of YDAccount. If no any limit is made, the MaxLoginCount will be -1. At the same time, the LoginCount of YDAccount records the current total connections to the fund account. For different connections under the same fund account, MaxLoginCount and LoginCount are always the same.

If investors need to make a distinction among different connection orders, the Order Group function should be preferred. It is **not recommended** to use the native SessionID mechanism mentioned in the following text.

> In version 1.386, YD provides a native SessionID mechanism, which is designed to meet the regulatory requirements of the Shanghai and Shenzhen Stock Exchanges. However, this mechanism was not designed with consideration for investors' trading needs. Therefore, it is not recommended for investors to use this SessionID mechanism in the trading process. However, it can be logged for troubleshooting purposes in the future. This mechanism is enabled by default in the spot trading counterparty but disabled by default in the futures trading counterparty. If you need to use it in the futures trading counterparty, please contact your broker to enable this feature on the counterparty side.
>
> The 'SessionID' is assigned by the counterparty, and a new 'SessionID' is allocated when the API establishes an initial connection or reconnects after disconnection. The maximum number of connections for all investors is 4096, and SessionID numbers range from 0 to 4095. The system randomly assigns SessionIDs and does not allocate them in the order of connection. After a disconnection, the corresponding SessionID will be reclaimed for reuse. Therefore, during different times of the same trading day, SessionIDs may be duplicated among different investors, and even the same investor may receive the same SessionID again. However, within the same time period, the SessionIDs of different connections are always different. Therefore, it is strongly recommended that investors always obtain the 'getSessionID' through 'notifyLogin'. The function to obtain the 'SessionID' is shown below:
>
> ```
> virtual int getSessionID(void)
> ```
>
> The 'SessionID' for orders and quotes can be obtained from 'YDOrder.SessionID' and 'YDQuote.SessionID', respectively. After a regular counterparty restart or failover switch between primary and standby counterparties, the 'SessionID' in the order feedback returned by the counterparty will be set to -1.

> For previous API versions, YD provided investors using ydExtendedApi with a low-order coding SessionID mechanism with OrderRef. However, considering many restrictions, YD no longer suggests its preference. In order to maintain the compatibility, this mechanism is still reserved for the order group numbered 0 in the current version. If investors use non-zero order groups, the following is invalid.
>
> Please note that once decided, this mechanism should be configured for all connections, otherwise it may lead to potential OrderRef coding conflicts. For multi-connection investors who have used Local Risk Control Order, the SessionID mechanism must be used, otherwise all OrderRef numbers issued through the connections will conflict.
>
> This connection number mechanism involves the following functions:
>
> ```
> virtual bool setSessionOrderRefRule(unsigned sessionBitCount,unsigned sessionID)=0;
> virtual void getSessionOrderRefRule(unsigned *pSessionBitCount,unsigned *pSessionID)=0;
> ```
>
> Please set the thread number and global thread number rules through setSessionOrderRefRule **before submitting any order and quote**. The parameters of setSessionOrderRefRule are described as follows:
>
> - An end digit reserved for SessionID is set in sessionBitCount when OrderRef is used, which can be used for determining the maximum counts of connections and orders. The reserved digit can have at most 16 bits and must be the same for all connections
> - The sessionID marks the connection number of this connection. Please number each API instance connection from 0 and make sure that the total connections be kept within the range specified by sessionBitCount
>   For example, assuming that the set sessionBitCount of a connection is 8 and SessionID is 3, then 8 bits in the OrderRef are used for expressing the connection number, and the remaining 24 bits (32-8=24 bits), expressing the actual order number. Therefore, under this setting mode, there can be 256 (2^8) connection numbers, and each connection can have 16,777,216 (2^24) orders, and the connection number for this API instance is 3. The first OrderRef for this connection is 259 (0b100000000+0b11=0b100000011=259). After setting, the getSessionOrderRefRule can be used to obtain the set connection number coding rules, and the getNextOrderRef, to obtain the next order reference number.

7.7. Raw protocol

If a '1.280' or higher version API is used, the raw protocol below should be followed strictly for submitting orders and receiving notifications, otherwise they will be considered as error orders. If a '1.188' or lower version API is used, please refer to the corresponding raw protocol versions.

7.7.1. Up-bound message

Starting from Version '1.52', YD has opened the order submission and cancellation message operations, and added the quote submission, cancellation and various notification message operations in Version '1.280'. Investors can send self-compiled UDP messages to YD OMSs for trading. Since the raw protocol order submission means that users can combine and send their own data packets, its performance directly depends on users' implementation and has nothing to do with the YD API. Whether submitting orders under a raw protocol or the UDP mode of YD API, there is no difference in look-through performance at the OMS ends. Therefore, comparing with API, the performance only differs at client sending ends.

After a long period of time of iteration, the performance of YD API tested in a YD's laboratory (through X10/25 and X2522 network cards) has reached the conditions for common FPGAs. If a customer wants to submit orders based on a raw protocol, the quicker method for production order submission should be selected after completing the implementation and comparing it with the order performance of YD API.

API provides the timestamp function getYDNanoTimestamp, which, relying on its high accuracy and quick speed, can be used for testing the API's order submission speed. The specific method is calling getYDNanoTimestamp before and after insertOrder and subtracting the results. The final result is the time difference between the sending time and the first byte appearing on the optical fiber.

The order submission & cancellation under a raw protocol can be conducted through UDP or XTCP. The UDP or XTCP port number can be found in SystemParam. Refer to System Parameters for details. Since being excluded in YD's check, any source port number can be used. When using the XTCP raw protocol for order placement, please send a heartbeat message to the counterparty every 2 seconds to maintain the connection.

7.7.1.1. Preparation before operation

Investors can use the raw protocol after the approval of the broker. Just contact the broker to enable the protocol before using. Investors can check YD_ AF_ BareProtocol for being set for YDAccount.AccountFlag to confirm whether the raw protocol has been enabled or not.

UDP message headers should be obtained by calling getClientPacketHeader. A message header contains information such as account and key, so no part of the message header can be modified. The message header can only be obtained during notifyFinishInit operation and its subsequent steps. Once a message header is successfully obtained, it will not change during the OMS operation. It should be obtained again once the OMS is restarted. Investors using raw protocol orders on the spot trading counterparty, please take note. Due to the requirement of enabling the Native SessionID Mechanism on the spot trading counterparty, if a disconnection and reconnection occur during trading hours, the raw protocol message header before the disconnection will become invalid. It is essential to retrieve the message header again in the 'notifyLogin' after a successful login.

```
/// definition of protocolVersion
///   0: newest protocol version
///   1: protocol for api version up to 1.188
///   2: protocol for api version from 1.280, current newest version
virtual int getClientPacketHeader(YDPacketType type,unsigned char *pHeader,int len,int protocolVersion=0)=0;
```

The YDPacketType can be YD_CLIENT_PACKET_INSERT_ORDER, YD_CLIENT_PACKET_CANCEL_ORDER, YD_CLIENT_PACKET_INSERT_QUOTE and YD_CLIENT_PACKET_CANCEL_QUOTE, which are used for obtaining message headers in relation to order submission/cancellation and quote submission/cancellation. Starting from version 1.280, YD has added four special types of order cancellation: YD_CLIENT_PACKET_INSERT_NORMAL_ORDER, YD_CLIENT_PACKET_CANCEL_NORMAL_ORDER, YD_CLIENT_PACKET_INSERT_SPECIAL_ORDER, and YD_CLIENT_PACKET_CANCEL_SPECIAL_ORDER. The first two can only be used for regular order cancellation, and if used for other business types, an error will occur. The last two can only be used for submitting and withdrawing non-trading operations such as exercise, abandonment of exercise, and covered positions. If used for regular order cancellation, an error will occur.

The "header" and "len" refer to the header pointer and length of the memory area created in advance by a user. The header is used for containing the header data generated by api. The len should be longer than the length of the corresponding type of header. At present, the header length of each operation is 16.

The 'protocolVersion' can be specified to indicate the version of the protocol message. The default version is the latest protocol message version, which is version 1.280. For raw protocol users who need to use the new features in the 1.280 protocol message, after upgrading to API version 1.280, adjustments need to be made based on the new message structure. Otherwise, the counterparties will discard them as erroneous messages. For investors who do not use the new features in the 1.280 protocol message, they can specify the use of the 1.188 protocol version by setting the protocolVersion to 1. This version has a shorter message length and offers a slight advantage in the time it takes to send and receive messages. The following listed message structure is for the new 1.280 protocol version. If you need the message structure for version 1.188, please refer to the API documentation for version 1.188.

The return value refers to the actual length of a returned message header. If the return value is 0, it means that message header obtaining fails, since, usually, the length of the pre-created memory area is insufficient, and the calling time is earlier than that for notifyFinishInit, or no raw protocol-based order submission function YD_AF_BareProtocol is enabled.

7.7.1.2. Order submission message

The following shows the message structure when submitting an order, which is equivalent to calling insertOrder.

Address offset	Length (bytes)	Field type	Description
0	16	Integer	Message header.
16	4	Integer (little-endian)	Instrument reference No. It can be obtained through the InstrumentRef of YDInstrument.
20	1	Integer	Trading direction (0: buy, 1: sell)
21	1	Integer	Position opening and closing flags (0: Position opening, 1: Position closing, 3: Today's position closing, 4: Pre position closing)
22	1	Integer	Hedge flags (1: Speculation, 2: Arbitrage, 3: Hedge)
23	1	Integer	Connection selection method (0: YD_CS_Any, 1: YD_CS_Fixed, 2: YD_CS_Prefered)
24	8	IEEE 754 Double-accuracy float type (little endian)	Price
32	4	Integer (little-endian)	Order volume
36	4	Integer (little-endian)	Order reference
40	1	Integer	Order Type (0: Price-limited order, 1: FAK, 2: Market price order, 3: FOK)
41	1	Integer	0
42	1	Integer	Connection number
43	5	Integer	0
48	1	Unsigned integer	Order group ID
49	1	Integer	OrderRef control mode of order groups, refer to Order Group 0: Monotonic increase OrderRef numbers. The gap between two OrderRef numbers must be higher than or equal to 1 1: The OrderRef numbers should be strictly monotonically increased, and the gap between two OrderRef numbers must be 1
50	1	Integer	Triggered order Type 0: No trigger 1: Profit taking trigger 2: Loss stopping trigger
51	13	Integer	0
64	8	IEEE 754 Double-accuracy float type (little endian)	Trigger price of triggered Order

7.7.1.3. Order cancellation message

The following shows the message structure for order cancellation, which is equivalent to calling cancelOrder. At present, three order cancellation modes i.e. full-accuracy exchange order reference No., exchange order reference No. and commissioned number OrderRef are supported. Refer to Normal Order Cancellation for details.

Address offset	Length (bytes)	Field type	Description
0	16	Integer	Message header.
16	4	Integer (little-endian)	Exchange order number or OrderRef for orders to be cancelled.
20	1	Integer	Exchange SN. Obtained from ExchangeRef of YDExchange.
21	1	Integer	Connection selection method (0: YD_CS_Any, 1: YD_CS_Fixed, 2: YD_CS_Prefered)
22	1	Integer	Connection number
23	1	Integer	0
24	1	Unsigned integer	Order group ID
25	7	Integer	0
32	8	Integer (little-endian)	Full-accuracy exchange order ID No.

7.7.1.4. Quote submission message

The following shows the message structure when submitting a quote which is equivalent to calling insertQuote.

Address offset	Length (bytes)	Field type	Description
0	16	Integer	Message header.
20	4	Integer (little-endian)	Instrument reference No. It can be obtained through the InstrumentRef of YDInstrument.
24	1	Integer	Bid offset flag
25	1	Integer	Bid hedge flag
26	1	Integer	Ask offset flag
27	1	Integer	Ask hedge flag
28	8	IEEE 754 Double-accuracy float type (little endian)	Bid price
36	8	IEEE 754 Double-accuracy float type (little endian)	Ask price
44	4	Integer (little-endian)	Bid volume
48	4	Integer (little-endian)	Ask volume
52	4	Integer (little-endian)	Order reference, namely OrderRef
56	1	Integer	Connection selection method (0: YD_CS_Any, 1: YD_CS_Fixed, 2: YD_CS_Prefered)
57	1	Integer	Connection number

Address offset	Length (bytes)	Field type	Description
58	1	Integer	0
59	1	Integer	Quote flag YD_YQF_ResponseOfRFQ: For automatically filling in the RFQ number to indicate the response price. It is supported by SHFE, INE, DCE, GFEX and CZCE. Other exchanges do not provide RFQ numbers.
60	1	Unsigned integer	Order group ID
61	1	Integer	OrderRef control mode of order groups, see Order Group 0: Monotonic increase OrderRef numbers. The gap between two OrderRef numbers must be higher than or equal to 1 1: The OrderRef numbers should be strictly monotonically increased, and the gap between two OrderRef numbers must be 1
62	6	Integer (little-endian)	0

7.7.1.5. Quote cancellation message

The following shows the message structure for quote cancellation, which is equivalent to calling cancelQuote. At present, three quote cancellation modes i.e. full-accuracy exchange order reference No., exchange order reference No. and commissioned number OrderRef are supported. Refer to Normal Quote Cancellation for details.

Address offset	Length (bytes)	Field type	Description
0	16	Integer	Message header.
16	4	Integer (little-endian)	Exchange quote number or OrderRef for quotes to be cancelled.
20	1	Integer	Exchange SN. Obtained from ExchangeRef of YDExchange.
21	1	Integer	Connection selection method (0: YD_CS_Any, 1: YD_CS_Fixed, 2: YD_CS_Prefered)
22	1	Integer	Connection number
23	1	Unsigned integer	Order group ID
24	8	Integer (little-endian)	Full-accuracy exchange quote number

7.7.2. Down-bound message

The down-bound messages of YD are sent through TCP. YD will not consider adding UDP down-bound messages until it can effectively solve the problem on reliable UDP delivery. Investors who need to parse down-bound messages should bypass and monitor TCP message segments, and properly handle possible troubles such as retransmission and adhesion.

7.7.2.1. Message header

YD's down-bound messages have the same header structure. After receiving a down-bound message, the message type of the header should be parsed first to determine the message structure for parsing subsequent data. The message header structure is shown below:

Address offset	Length (bytes)	Field type	Description
0	2	Integer (little-endian)	Message length (including the header of this message)
2	2		Non-public field
4	4	Integer (little-endian)	Message type
8	4		Non-public field

Address offset	Length (bytes)	Field type	Description
12	4	Integer (little-endian)	Investor account SN

The possible message types for the above message headers are shown below:

Message type	Description
0	Heartbeat
34	Order notification
35	Trade notification
37	RFQ
40	Quote notification
43	Notification for order or quote cancellation failure

7.7.2.2. Order notification message

Due to a large number of operations reusing order notification messages, please only focus on the order notification when the order flag is 0, and those non-zero order notifications should be ignored.

Address offset	Length (bytes)	Field type	Description
0	16		Message header
16	4	Integer (little-endian)	Instrument SN. Corresponding to InstrumentRef of YDInstrument.
20	1	Integer	Trading direction (0: buy, 1: sell)
21	1	Integer	Position opening and closing flags (0: Position opening, 1: Position closing, 3: Today's position closing, 4: Pre position closing)
22	1	Integer	Hedge flags (1: Speculation, 2: Arbitrage, 3: Hedge)
23	1	Integer	Connection selection method (0: YD_CS_Any, 1: YD_CS_Fixed, 2: YD_CS_Prefered)
24	8	IEEE 754 Double-accuracy float type (little endian)	Order price
32	4	Integer (little-endian)	Order volume
36	4	Integer (little-endian)	Investor's order reference No.
40	1	Integer	Order type (0: Price limited order, 1: FAK, 2: Market price order, 3: FOK)
41	1	Integer	Order flag
42	1	Integer	Specified connection number
43	1	Integer	Actually used connection number
44	4	Integer (little-endian)	Error No.
48	4	Integer (little-endian)	Exchange reference No.
52	4	Integer (little-endian)	Exchange order ID No.
56	4	Integer (little-endian)	Order status
60	4	Integer (little-endian)	Trade volume
64	4	Integer (little-endian)	Exchange order submission time
68	4	Integer (little-endian)	Local order reference No. of the OMS

Address offset	Length (bytes)	Field type	Description
72	1	Unsigned integer	Order group ID
73	1	Integer	OrderRef control mode of order groups, refer to Order Group 0: Monotonic increase OrderRef numbers. The gap between two OrderRef numbers must be higher than or equal to 1 1: The OrderRef numbers should be strictly monotonically increased, and the gap between two OrderRef numbers must be 1
74	1	Integer	Trigger order Type 0: No trigger 1: Profit taking trigger 2: Loss stopping trigger
75	13		Non-public field
88	8	IEEE 754 Double-accuracy float type (little endian)	Trigger price of triggered Order
96	4	Integer (little-endian)	Order trigger status 0: Not Triggered 1: Triggered
100	4	Integer (little-endian)	Millisecond counts from the beginning (17:00) to the trade time of a trading day. For example: 500 ms past 21:00 in night trading hours: 3600*(21-17)*1000+500 = 14400500 500 ms past 9:00 in day trading hours: 3600*(24+9-17)*1000+500 = 57600500 500 ms past 9:00 in Monday's trading hours: 3600*(24+9-17)*1000+500 = 5760500 For the conversion between YD's timestamp time and reference time, see string2TimeStamp and timeStamp2String of ydUtil.h
104	8	Integer (little-endian)	Full-accuracy exchange order ID No.

7.7.2.3. Trade notification message

Address offset	Length (bytes)	Field type	Description
0	16		Message header
16	4	Integer (little-endian)	Instrument SN. Corresponding to InstrumentRef of YDInstrument.
20	1	Integer	Trading direction (0: buy, 1: sell)
21	1	Integer	Position opening and closing flags (0: Position opening, 1: Position closing, 3: Today's position closing, 4: Pre position closing)
22	1	Integer	Hedge flags (1: Speculation, 2: Arbitrage, 3: Hedge)
23	1		Non-public field
24	4	Integer (little-endian)	Exchange trade ID No.
28	4	Integer (little-endian)	Exchange order ID No.
32	8	IEEE 754 Double-accuracy float type (little endian)	Trade price
40	4	Integer (little-endian)	Trade volume
44	4	Integer (little-endian)	Exchange trade time
48	8	IEEE 754 Double-accuracy float type (little endian)	Trade commission

Address offset	Length (bytes)	Field type	Description
56	4	Integer (little-endian)	Local order reference No. of OMS
60	4	Integer (little-endian)	Investor's order reference No.
64	1	Unsigned integer	Order group ID
65	1	Integer	Actually used connection number
66	2		Non-public field
68	4	Integer (little-endian)	Millisecond counts from the beginning (17:00) to the trade time of a trading day. For example: 500 ms past 21:00 in night trading hours: 3600*(21-17)*1000+500 = 14400500 500 ms past 9:00 in day trading hours: 3600*(24+9-17)*1000+500 = 57600500 500 ms past 9:00 in Monday's trading hours: 3600*(24+9-17)*1000+500 = 5760500 For the conversion between YD's timestamp time and reference time, see string2TimeStamp and timeStamp2String of ydUtil.h
72	8	Integer (little-endian)	Full-accuracy exchange order ID No.
80	8	Integer (little-endian)	Full-accuracy exchange trade ID No.

7.7.2.4. RFQ notification message

Address offset	Length (bytes)	Field type	Description
0	16		Message header
16	4	Integer (little-endian)	Instrument SN. Corresponding to InstrumentRef of YDInstrument.
20	4	Integer (little-endian)	Second counts from the beginning (17:00) to the RFQ time of a trading day. For example: At 21:00 in night trading hours: 3600*(21-17) = 14400 At 9:00 in day trading hours: 3600*(24+9-17) = 57600 At 9:00 in Monday's trading hours: 3600*(24+9-17) = 5760 For the conversion between the integral time and reference time, see string2TimeID and timeID2String of ydUtil.h
24	4	Integer (little-endian)	RFQ ID No.
28	4		Non-public field
32	8	Integer (little-endian)	Full-accuracy RFQ ID No.

7.7.2.5. Quote notification message

Address offset	Length (bytes)	Field type	Description
0	16		Message header
20	4	Integer (little-endian)	Instrument SN. Corresponding to InstrumentRef of YDInstrument.
24	1	Integer	Bid offset flag
25	1	Integer	Bid hedge flag
26	1	Integer	Ask offset flag

Address offset	Length (bytes)	Field type	Description
27	1	Integer	Ask hedge flag
28	8	IEEE 754 Double-accuracy float type (little endian)	Bid price
36	8	IEEE 754 Double-accuracy float type (little endian)	Ask price
44	4	Integer (little-endian)	Bid volume
48	4	Integer (little-endian)	Ask volume
52	4	Integer (little-endian)	Customer's order reference No. i.e.
56	1	Integer	Connection selection method (0: YD_CS_Any, 1: YD_CS_Fixed, 2: YD_CS_Prefered)
57	1	Integer	Specified connection number
58	1	Integer	Actually used connection number
59	1	Integer	Quote flag YD_YQF_ResponseOfRFQ: For automatically filling in the RFQ number to indicate the response price. It is supported by SHFE, INE, DCE, GFEX and CZCE. Other exchanges do not provide RFQ numbers.
60	1	Unsigned integer	Order group ID
61	1	Integer	OrderRef control mode of order groups, refer to Order Group 0: Monotonic increase OrderRef numbers. The gap between two OrderRef numbers must be higher than or equal to 1 1: The OrderRef numbers should be strictly monotonically increased, and the gap between two OrderRef numbers must be 1
62	2		Non-public field
64	4	Integer (little-endian)	Error No.
68	4	Integer (little-endian)	Exchange SN. Corresponding to ExchangeRef of YDExchange.
72	4	Integer (little-endian)	If ErrorNo is YD_ERROR_InvalidGroupOrderRef, it means that the maximum OrderRef has been received by current OMS; Otherwise, it means a quote number for quote cancellation. If the return value of the exchange is too long, it will be truncated.
76	4	Integer (little-endian)	The OrderSysID of the bid quote, which is 0 when selling a one-side quote. If the return value of the exchange is too long, it will be truncated.
80	4	Integer (little-endian)	The OrderSysID of the ask quote, which is 0 when buying a one-side quote. If the return value of the exchange is too long, it will be truncated.
84	4	Integer (little-endian)	When YDQuoteFlag is YD_YQF_ResponseOfRFQ, the order response RFQ number will be recorded, otherwise will be 0. If the return value of the exchange is too long, it will be truncated.
88	4		Non-public field

Address offset	Length (bytes)	Field type	Description
92	8	Integer (little-endian)	Full-accuracy quote number for quote cancellation
100	8	Integer (little-endian)	The OrderSysID of a full-accuracy bid quote, which will be 0 when selling a one-side quote
108	8	Integer (little-endian)	The OrderSysID of a full-accuracy ask quote, which will be 0 when buying a one-side quote
116	8	Integer (little-endian)	When YDQuoteFlag is YD_YQF_ResponseOfRFQ, the full-accuracy order response RFQ number will be recorded, otherwise will be 0

7.7.2.6. Notification message for order or quote cancellation failure

Due to a large number of operations reusing order or quote cancellation notification messages, please only focus on the order cancellation notification when the order flag is 0, and those non-zero order cancellation notifications should be ignored.

Address offset	Length (bytes)	Field type	Description
0	16		Message header
16	4	Integer (little-endian)	Exchange order reference No. or quote NO.
20	1	Integer (little-endian)	Exchange SN. Corresponding to ExchangeRef of YDExchange.
21	1	Unsigned integer	Order group ID
22	1		Non-public field
23	1	Integer	Order flag YDOrderFlag, invalid in case of a notification message for quote cancellation failure
24	4	Integer (little-endian)	Error No.
28	4	Integer (little-endian)	Quote flag IsQuote. 1: This message relates to a notification for a quote cancellation failure 0: This message relates to a notification for an order cancellation failure
32	4	Integer (little-endian)	Investor's order reference No. OrderRef
36	4		Non-public field
40	8	Integer (little-endian)	Full-accuracy exchange order reference No. or quote No.

7.7.2.7. Heartbeat message

Address offset	Length (bytes)	Field type	Description
0	16		Message header

7.8. Designated seat

A proxy-server refers to the server of an exchange trading system that help the OMSs to connect and receive OMS submitted orders and returned notifications. Generally, more than one server is used. Considering the difference in connection counts for each proxy-server as well as the imbalance in instantaneous operation volume, the performance of different proxy-servers in delivering orders to the trading core may also vary. Therefore, during trading, investors should have an evaluate on the performance of each proxy-server and select the quickest one for order submission.

A connection refers to an account configured in the OMSs for connecting to a proxy-server. YD is always trying its best to make each connection compliantly connect to different proxy-server for the sake of investors' freest choice. When a broker arranges a YD OMS, it usually configure the same count of connections as that of exchange proxy-servers. Generally, the connections of YD OMSs can cover all exchange proxy-servers, and therefore, selecting a proxy-server is essentially means selecting a connection.

Through YD OMSs, investors can specify connections used for up-bound instructions. The methods for obtaining proxy-server information and designating connection for order submission are described below.

7.8.1. Obtaining connection information

YD OMSs support connecting to multiple exchanges for simultaneous trading. The connection information for each exchange is completely independent, and therefore, the following contents relate to a single exchange.

The total connections of an exchange can be found through YDExchange.ConnectionCount. The numbers of the first and last connections are 0 and ConnectionCount-1, respectively. In YD, the connections can be divided into public and dedicated ones:

- Public connection: Connections that can be used by all investors. All public connections are listed through YDExchange.IsPublicConnectionID[64]. A connection can be checked for being a public one according to the connection number. If IsPublicConnectionID[i] is "True", it means the ith connection is a public one, otherwise, a dedicated one.
- Dedicated connection: Only applicable to designated investors. Each dedicated connection can be designated to multiple investors, and each investor can also use multiple dedicated connection. The dedicated connection information for each investor is listed through YDAccountExchangeInfo.IsDedicatedConnectionID[64]. If IsDedicatedConnectionID[i] is "True", the ith connection will be a dedicated one for an investor, otherwise it will not be a dedicated one.

Thus, the **optional connections** of investors are the superposition of public and dedicated connections, while the **non-optional connections** are dedicated connections of other investors.

Investors may want to compare the performances of two OMSs under the same proxy-server. In version 1.386, investors can retrieve the connection information through 'YDExchange.ConnectionInfos' (accessible directly by array indexing, with the array size being 'YDExchange.ConnectionCount'). Additionally, YD API also informs about the connection information through 'notifyExchangeConnectionInfo' after 'notifyFinishedInit'. It provides the initial status of all connections during the first startup. In case there are changes in connection information due to disconnection or other reasons during trading hours, such updates will also be notified through the aforementioned callback.

```
virtual void notifyExchangeConnectionInfo(const YDExchangeConnectionInfo *pExchangeConnectionInfo)
```

The field information of 'YDExchangeConnectionInfo' is as follows:

Field	Description
ExchangeRef	Exchange reference No. It can be obtained from YDExchange.
ConnectionID	Connection ID
ConnectionStatus	Connection status YD_ECS_DISCONNECTED=0：Seat disconnected YD_ECS_CONNECTED=1：Seat connected
Info	Front-end IP address information
InsertFlowControl	Check the maximum number of orders per interface within the time window during order placement or quotation.The expression format is count/window, In the expression, the numerator 'count' represents the quantity limit, and the denominator 'window' represents the size of the time window for checking. If the numerator is less than or equal to 0, it indicates no upper limit. If the denominator is not specified or is less than or equal to 1, it represents 1000. For example, 50/1000 means that within a sliding time window of 1000 milliseconds, no more than 50 orders are allowed to be placed. Generally, the SHFE allows 50 orders within a 1000-millisecond time window, while other exchanges allow 100 orders within the same time window.

Field	Description
CancelFlowControl	Check the maximum number of order cancellations per interface within the time window during order cancellation or cancellation of quotes. The expression format is count/window. In the expression, the numerator 'count' represents the quantity limit, and the denominator 'window' represents the size of the time window for checking. If the numerator is less than or equal to 0, it indicates no upper limit. If the denominator is not specified or is less than or equal to 1, it represents 1000. This field can be left empty, indicating the same as the seat's order rate limit. For example, 50/1000 means that within a sliding time window of 1000 milliseconds, no more than 50 order cancellations are allowed. Generally, the SHFE allows 50 order cancellations within a 1000-millisecond time window, while other exchanges allow 100 order cancellations within the same time window.

7.8.2. Designated connection for order submission

Investors can set the ConnectionSelectionType and ConnectionID under the YDInputOrder and YDInputQuote to select order submission connections in different ways. The selection logic for preferred selection methods of various connections is shown below. Please note that disconnected, flow-control-limit reached, and non-selectable connections are excluded in connection selection.

- When ConnectionSelectionType is YD_CS_Any, a global poll will be achieved. The specific rules are:
  - All connections will be traversed one by one from the one subsequent to that using YD_CS_Any for order submission (the traversal will start from the beginning after reaching the last connection until reaching the starting connection of the traversal). If a connection is found not involved in the queue, it should be selected directly. Otherwise, check whether the order queue length of the connection is shorter than that of each previous connection. If being the shortest, just record it until the traversal is completed. Select the connection with the shortest recorded queue length. Finally, insert the order into the selected connection queue for submission.
  - The poll does not make exceptions to investors, namely the orders of all investors are uniformly polled. Therefore, an investor submitting order under this mode may not be able to obtain consecutive connection numbers from through RealConnectionID.
- When ConnectionSelectionType is YD_CS_Fixed, a designated connection order submission will be achieved. The specific rules are:
  - Directly select the connection and insert the order into the queue for submission.
- When ConnectionSelectionType is YD_CS_Prefered, a designated connection will be preferred for order submission, other connections can be used if it is busy. The specific rules are:
  - All connections will be traversed one by one from the one subsequent to that specified by the ConnectionID (the traversal will start from the beginning after reaching the last connection until reaching the starting connection of the traversal). If a connection is found not involved in the queue, it should be selected directly. Otherwise, check whether the order queue length of the connection is shorter than that of each previous connection. If being the shortest, just record it until the traversal is completed. Select the connection with the shortest recorded queue length. Finally, insert the order into the selected connection queue for submission.

In some cases, perhaps no any connection will be selected. YD lists various errors that may exist when searching for selected connections through different error codes:

- As long as one connection reaches the flow control limit, and all other connections are not dedicated, disconnected or have reached the upper limit of the connection queue, an error of " YD_ERROR_CanNotSendToExchangeForFlowControl=79 no available connection is provided and some connections reach the flow control limit" will be shown.
- If all connections are not dedicated, disconnected, or have reached the queue limit, an error of "YD_ERROR_CanNotSendToExchange=9 No available connection" will be shown.

When an order that has already been involved in the connection queue moves to the top and is ready for submission to an exchange, if exchange APIs such as orders, quotes, combinations and exercises reach the upper limits during submission or an error is sent back due to a disconnection, a message "YD_ERROR_ExchangeConnectionSendError=80 Exchange API transmission error" will be sent back. When the above error is caused and the OMS notification function for YD_AF_NotifyOrderAccept is enabled under YDAccountFlag, the notifyOrder notifications received will randomly be one of the following, so investors' strategy program should not rely on the notification counts, but focus on the notification status:

- A notification for OrderStatus=YD_OS_Rejected and ErrorNo=YD_ERROR_ExchangeConnectionSendError will be received
- Two notifications will be received, the first of which is that for OrderStatus=YD_OS_Accepted and ErrorNo=0, and the second, that for OrderStatus=Rejected and ErrorNo=YD_ERROR_ExchangeConnectionSendError

The selected connection can be obtained through the YDOrder of the notification or the RealConnectionID of the YDQuote.

7.8.3. Designated connection for order cancellation

Investors can set the ConnectionSelectionType and ConnectionID under the YDCancelOrder and YDCancelQuote to select order cancellation connections in different ways. Unlike order submission, the cancellation is dependent on the type of the OMS connections and therefore cannot be completely selected according to investors' settings.

- When the OMS connections are subject to full-management, the processing logic is the same as that of designated connections for order submission;
- When the OMS connections are subject to "first connection - management and other connection - non-management", the original order submission connection and first management connection should be checked in order. If a connection is not involved in the queue, select it directly, otherwise, select the connection with a shorter queue length. If the queue length is the same, select the original order submission connection. Finally, insert the order into the selected connection queue for submission.
- When the OMS connections are subject to full-non-management, the order cancellation must be conducted from the original order submission connection. At this time, the original order submission connection should be selected through the OMS and the order should be inserted into the connection queue for submission

As with the designated connection order submission, the designated connection order cancellation will cause errors for exactly the same reasons. Refer to Designated Connection Order Submission.

There is no way for APIs to obtain the selected connection in order cancellation. If this information is needed during troubleshooting, just contact the broker to help you query it through inputFlow.txt of the OMSs.

7.8.4. Connection flow control

At present, the exchanges have two connection flow control modes for restricting the connection order transmission speed. Please note that the connection flow control does not make exceptions to investors, and the orders of all investors using the same connection are calculated in summary on the OMSs:

- Order flow control per second: For limiting the maximum counts of order submissions and cancellations per second for each connection or gateway. If exceeding the limit, the specific behaviors of each exchange APIs differ. Some exchange APIs will directly reject orders, and some will cache the orders until the next second for transmission. At present, all exchanges have this connection flow control mode and have announced their flow control thresholds. See the following table for the specific threshold information;
- Order flow control under transmission: For limiting the volume of orders that have been sent to exchanges but have not received the notification. If exceeding the limit, the APIs will directly reject the orders. At present, only some exchanges have this connection flow control mode, and no flow control thresholds have been announced.

Exchange	Order flow control threshold per second
CFFEX, SSE, SZSE	50
SHFE, INE, DCE, GFEX, CZCE	100

In order to avoid the caching and delay of orders due to order volume flow control per second, and to meet the principle of reporting errors as early as possible, YD OMSs has implemented a restriction on order volume flow control per second. Intercepting orders before submission to APIs will result in API flow control of order submission and cancellation. For specific error reporting information, refer to Designated Connection for Order Submission. However, due to the fact that exchanges have not announced the control methods and thresholds for order flow control under transmission, in order to ensure the compliance, YD did not implement a restriction on order flow control under transmission, but directly adopted the API flow control measures of exchanges.

7.8.5. Connection preference

In order to eliminate the slowest one, investors should compare the performance of each proxy-server. The specific evaluation method should be implemented by investors based on the strategy. Generally, a single connection can be preferably selected through sending YD_CS_Fixed orders to all connections at a minimal gap: The connection with the smallest exchange order reference number OrderSysID in notifications for all connections is the best one in the test round. Through repeating the above steps and making a statistical analysis, the best connection recognized by investors can be selected, then this connection can be designated for order submission through YD_CS_Fixed and YD_CS_Prefered. Please note that the evaluation should not be too frequent, otherwise it may lead to order blocking on an OMS, disrupting the normal trading of other investors using the OMS, and even being considered as abnormal trading by exchanges.

If a broker has the ability to perform a preferred selection and hopes its customers use its preferred results, or perform a preferred selection at its exclusive OMS through one of the accounts and hopes that other accounts can also be available for submitting orders according to the preferred results, it can regularly transmit the preferably selected connection results for other accounts using the same OMS through the preferred connection reporting interface selectConnections. Only when the YD_AF_SelectConnection flag is set for YDAccount.AccountFlag

can investors and administrators be allowed to use this interface.

```
virtual bool selectConnections(const YDExchange *pExchange,unsigned long long connectionList)=0;
```

The connectionList can be considered as a sequence of elements with a length of 4 bits, with each 4-bit representing one connection number, and the lowest bit representing the quickest connection. All exchanged connection numbers must be specified. For example, if you want to set the connection sequence (proxy-server) from quick to slow to 2-3-1-4, the binary representation of the connectionList will be: 0100 0001 0000 0011 0010.

The validity period of the preferred seat result is MaxSelectConnectionGap (default value is 5 minutes), otherwise the submitted results will be invalid; If the result is expired after a timeout, it is recommended to submit a new report within the MaxSelectConnectionGap time limit to prevent the expiration and invalidation of the seat selection mechanism. At the same time, the call shall not be too frequent, and the minimum gap shall not be shorter than MinSelectConnectionGap (60s by default). For the obtaining method of MaxSelectConnectionGap and MinSelectConnectionGap, refer to System Parameters.

If the submitted results are expected to be used for other accounts, the order must be submitted or cancelled through YD_CS_Any. When the submitted results are valid, the connection selection rules are: Traverse all connections one by one in the sequence specified by the submitted results. If a connection is found not involved in the queue, select the connection directly. Otherwise, check the order submission queue length of the connection for being shorter than that of all previous connections. If it is the shortest, record the connection until the traversal is completed. Select the connection with the shortest recorded queue length. Finally, insert the order into the selected connection queue for submission.

7.9. Emergency position closing

Under extreme circumstances, it may be impossible or hard to close positions for the market after opening. Therefore, YD provides an emergency position closing function based on delayed freezing. This function allows investors or brokers to submit position closing orders with a higher frequency during trading, making it easier to successfully close positions by arranging orders at the top. The investors' YDAccount.AccountFlag can only be used after YD_AF_NoCloseFrozenOnInsertOrder is set.

After enabling this function and receiving a closing instruction from an investor, the OMS will not freeze the positions unless the receiving a notification from the exchange after a successful order submission. Thus, investors can send multiple position closing instructions at the same time before trading. Once receiving a notification of a successful order submission, the positions will be frozen immediately, and the subsequent closing instructions will be prevented from being sent. Position closing based on delayed freezing only means a delay in the freezing and does not mean that positions will not be checked. If an investor's order volume exceeds the position volume, the orders will not pass the position check, and order errors will be reported. For example, suppose an investor has two lots of instrument-based positions, before receiving a notification, he/she can submit multiple one-lot and two-lot position closing orders, however those exceeding 2 lots will be not allowed.

The emergency position closing function may cause a large number of error orders to exchanges, so it should be used prudently and prevented from being used for normal operations such as hurried order submittion after opening. YD does not assume any responsibility for regulatory penalties caused by misoperation. At the same time, for the system with full-non-management connections, the position closing function based on delayed freezing may encounter problems that cannot be solved. Do not use it in the system with full-non-management connections if possible. Error scenarios: Assuming that an investor conducts the sell-to-close, buy-to-open and then sell-to-close operations, if the two sell-to-close operations are performed first, the position data of the customer will be wrong finally.

7.10. Unknown timeout order processing

An unknown overtime order refers to that that without received notification from an exchange after being submitted by an OMS for a certain period of time. Since no any notification from the exchange is received, the status of the order will not change. Because the margin or position is frozen continuously, this order will remain in the OMS and cannot be released. Unknown timeout orders are usually caused by submissions performed when exchanges are disconnected or when the states of exchanges are switched, however, the probability is extremely low. YD provides a function for processing unknown overtime orders, however, when using it, the following instructions should be followed strictly. The orders can be processed only when confirmed as unknown ones for fear of losses.

YD OMSs can be used to continuously monitor YD_OS_Accepted orders (except those RFQ orders and instructions of DCE and GFEX with the YDOrderFlag set to YD_YOF_Mark). If no any notification regarding an order is received from the OMS within the MissingOrderGap (60s by default, which can be modified by brokers. For details, refer to System Parameters), the investor will be notified of an unknown timeout order via notifyMissingOrder:

```
virtual void notifyMissingOrder(const YDMissingOrder *pMissingOrder)
```

The structure YDMissingOrder of unknown timeout orders is the same as YDOrder, however, when sending back a notification, YDMissingOrder.InsertTime is filled out with the time of receipt at the OMS, which is different from the exchange time YDOrder.InsertTime and should be noted.

After receiving a notification, investors should first confirm the order status at the primary OMS:

- If the primary OMS has the information about this order, it is obvious that this order has been received by the exchange and the notification sent by the exchange has been lost;
- If the primary OMS has no any information about this order, it means that the notification has not been sent to the exchange, or the exchange has not yet sent the notification. Considering that there have been notifications from exchanges with a timeout for more than one minute during production, waiting for a further period of time is suggested.

If it has been confirmed that the order is an unknown timeout one, just ask the broker for help. The broker's operators should also abide by the above rules and help the investor to cancel the unknown timeout order after a **prudent** judgment. The unknown timeout order can only be cancelled through the broker's administrator account rather than the investor himself/herself. After the broker cancels the unknown timeout order, the cancellation notification for the unknown timeout order will be sent back through notifyOrder. The returned YDOrder.ErrorNo will be YD_ERROR_InternalRejected, and YDOrder.OrderStatus will be YD_OS_Rejected.

If a notification from the exchange is received after cancelling the "unknown timeout order", YD OMS will handle it as an external order. Both the OrderRef and OrderLocalID of an external order are -1, thus losing the association with the original order. Of course, at this time, the investor can cancel the order. If then a trade notification is received, YD will update the positions and send the trade notification to the investor, so it is unnecessary to worry about the correctness of the positions and funds.

7.11. Performance tuning

The performance tuning aims to reduce overall look-through delay, namely from receiving the market data to sending an order request from the OMS to the exchange, steps such as market data receiving, strategy calculation, client order submission, switch forwarding, OMS risk control and submission to exchange are included. Each of the above steps is set on the critical path for trading. The low performance of one step can offset the high performance of other steps. The market leadership can only be ensured when the highest look-through performance of each step is kept.

Among them, client order submission and OMS risk control and submission to exchange are key steps in the trading services provided by YD. The look-through time points of these two steps are called API look-through performance and the OMS look-through performance, respectively.

7.11.1. API look-through performance

The API look-through performance refers to the time difference between starting to call insertOrder (or other order submission methods) and appearing the first byte for order submission on the optical fiber.

Since most OMSs' APIs will send back information immediately after being called, the only way to test the API look-through performance is to divide the "TX" ports of the up-bound OMSs of the investor strategy host and loopback to the sniff network card on the strategy host, and keep the clock on the sniff network card synchronized with the system clock. Record the timestamp of the system clock before submitting the order as the start timestamp. Use tcpdump or similar tools to timestamp the order packets received by the sniff network interface as the end timestamp. The difference between the two timestamps is the API's latency. The sniff network interface needs to support nanosecond-precision hardware timestamps and should be synchronized with the system time using the corresponding tools. If using the tcpdump tool, you can refer to the following command:

```
tcpdump -i <if_name> -n --time-stamp-type=adapter_unsynced --time-stamp-precision=nano -w <pcap_file>
```

The return of the insert order function in the YD API indicates that the data packet has been sent over the optical fiber. Therefore, a simple method to obtain latency is to directly record system timestamps before and after the order submission and calculate the difference. It is recommended that investors measure the latency performance of the YD API using the aforementioned standard testing method for latency and compare it with the simple method. If the final conclusion shows that the results of the standard testing method and the simple testing method are essentially consistent, then the simple method can be used for measuring the latency performance of the YD API in subsequent evaluations. Please note that before using the simple method to measure the latency performance of other APIs or raw protocol, it is essential to calibrate the feasibility of the simple method using the standard testing method.

YD provides a quick and high-accuracy timestamp function with a low performance overhead and no excessive impact on the critical path for order submission can be caused. When testing the API look-through performance, timestamps can be obtained by using this function before and after using the order submission function, and the nanosecond count for API look-through delay can be obtained by calculating the difference value between the timestamps.

```
// Returns nanoseconds elapsed since current process starts up
YD_API_EXPORT unsigned long long getYDNanoTimestamp();
```

After a long period of iterative optimization of APIs, YD can realize its API look-through performance of less than 250ns when using Solarflare X2522 or Exanic X10/X25 network cards and its acceleration software. If the actual look-through performance tested by investors does not reach this indicator, the network card and startup method should be checked first for meeting YD's requirements and, if possible, reaching the official performance standard. If not, contact YD through a broker.

Investors who have used raw protocols on other systems tend to use raw protocols. Considering investors' trading habits, YD also provides a method of Raw Protocol for order submission and cancellation. However, the look-through performance of YD APIs has reached the level of ordinary FPGAs. Therefore, if investors try to implement their own raw protocol-based order submission, they can compare its look-through performance with that of YD APIs after implementing the raw protocol-based order submission, and the quicker method can be selected for production of orders.

7.11.2. OMS look-through performance

The OMS look-through performance refers to the time difference when the first byte for order submission enters and leaves an OMS. This indicator can be used for objectively and impartially demonstrate the OMS performance and is the most commonly used one to judge the OMS performance.

The measurement is generally performed with an optical splitter or a port mirror in the industry. The optical splitter is characterized by high accuracy and low cost and is suitable for temporarily arranged measurement though being hard to adjust; The port mirror is easy to adjust, but only high-end models such as Arista 7130 can simultaneously and functionally help to achieve minimal performance impact and maximum measurement accuracy. Mid-to-low end models are not suitable for OMS look-through performance measurement. YD provides brokers with special tools to measure and analyze the up-bound look-through performance of each order submission, quote submission, and order cancellation through OMSs. If you want to know your order look-through data, just ask the broker for help.

In most cases, the look-through performance should not be a concern for investors. YD has conducted comprehensive tests for all versions to ensure that YD's expected performance indicators can be achieved during production. If investors suspect that the look-through performance deteriorates, resulting in a decline in earnings, they can contact a broker to check the look-through delay for meeting the performance standard. The standard performance will be provided to the broker upon completion of each server test.

Under some special trading behaviors, the look-through performance of OMSs will deteriorate. At present, it is known that sending orders through OMSs too quick or too slow may significantly cause a prolongation of the look-through delay, which should be handled separately. If the look-through performance deterioration is not caused by these trading behaviors, please contact YD's customer service department for troubleshooting.

7.11.2.1. Order blocking

Order blocking can be caused when multiple orders are sent from the same designated connection to an OMS at a gap shorter than the look-through delay. Due to the TCP connection of exchanges, the orders need to be queued for submission. On one hand, they will be submitted at the same time, while on the other hand, they are queued for submission, thus, in terms of look-through performance, in addition to the normal look-through delay of the first order, the look-through delay of each subsequent order will be prolonged by a relatively fixed period of time compared to the previous one, resulting in order blocking.

Order blocking may be caused by one or more of the following circumstances.

- When orders are queued through "Fix" and sent by the same connection (For "Any" and "Preferred" orders, queuing is not required), it is liable to cause that investors always consistently use their preferred connections, if determined, to submit orders.
- Some investors always submit orders too frequently, resulting in a prolongation of the busy time of the connection and a higher possibility of the subsequent Fix instructions for queuing. For example, a customer is sending preferred orders frequently through a connection and has not avoided the arrival time of the market data segments.
- The arrived market data segments or trading nodes have a starting gun effect, and most investors hurry on submitting orders at the same time.
- Some investors used a wrong warm-up method, resulting in a huge volume of orders at an OMS. For example, sending and cancelling orders at the OMS at a very high frequency in order to achieve a warming effect.
- Sending orders to different connections at the same time can also cause a sequential prolongation of delay periods, however, the prolongation is much less than that for one connection. It is common that when sending preferred orders to all connections, the look-through delay of preferred orders for subsequent connections will prolong slightly.

Order blocking is essentially caused by normal trading. In addition to further reducing the look-through delay. YD has no better ways to alleviate such problem. For brokers, investors should be dissuaded in time from taking such wrong warm-up measures. If investors submit their preferred orders too frequently through connections or fail to adjust the time periods suggested according to the market data segments for sending preferred orders, they, when causing a server confliction, should become separated and be arranged on different OMSs.

7.11.2.2. Slow order submission

When the order submission speed on an OMS is too slow, the cache of the OMS server will cool down, and the look-through delay of the order will significantly be prolonged when new orders arrive. In most cases, the OMS will not encounter this problem since the orders of all investors trading through the OMS will warm up the cache. This problem can only be caused when all investors on the OMS submit orders at a very low speed (such as at a frequency of 1 order / min for the entire OMS). When this problem is confirmed by the investors and brokers, it is suggested that investors send warm-up orders in advance to avoid this problem. The sending method and timing of warm-up orders are described below.

The best warm-up effect can be achieved when the warm-up orders and formal orders are sent through the same execution path.

- The warm-up effect is best when the execution path is the same for warm-up orders and formal orders. For example, when formal orders are submitted, the warm-up effect achieved through order submission is better than that through order cancellation.
- The warm-up effect of warm-up orders is only suitable for connections specified for the warm-up orders, while, for other connections, which is limited.
- The execution path of warm-up orders that fail to reach exchanges is shorter than that of formal orders, and the warm-up effect cannot achieve the best.
- When warm-up orders and formal orders are sent from the same connection under different instruments, the execution path is the same, which can help to achieve the warm-up effect.

The gap between warm-up order and formal order submission can also affect the warm-up effect. Tests have shown that the best warm-up effect can be achieved when the two are sent at a gap of 5s. Shorter gaps cannot help to achieve a better effect but can cause freezing of the order margin for a longer time before receiving notifications, which can also cause a higher pressure or even order blocking on the OMS. Warm-up orders should not be submitted when receiving market data, otherwise normal orders may be blocked. Since warm-up orders are not intensively sent, it is relatively easy to solve this problem.

The warm-up effects for different investors do not affect each other, and therefore do not worry that other customers' warm-up behaviors will affect your own warm-up effect. In fact, they also have a certain warm-up effect on your formal order submission.

According to the sending conditions for the above-mentioned warm-up effect, namely the connection for warm-up order submission should be the same as that for formal order submission, the time for receiving market data should be calculated in order to send warm-up orders in advance and ensure that they have been sent to the exchange. This precise warm-up method is always suggested. For investors, the regularly sent preferred orders through their own connections are also feasible warm-up orders, however, the effect is not as good as that achieved through precise warming up.

8. Market data

YD OMSs can be used to forward market data segments from the proxy-server of an exchange to investors. The market data provided by YD is mainly used for calculating refreshed position profits/losses and margins, and in the event of a disruption in receiving multicast market data, providing backup market data. Compared to the sent multicast market of the exchange, it is slower and may case miss of trading opportunities, and therefore trading directly based on the forwarded market data is not recommended.

For investors setting RecalcMode to auto or subscribeOnly, the simplest way to obtain the **market data relating to a position instrument** is to directly query the market data relating to the corresponding instrument through the market data pointer m_pMarketData. Refer to Fund Refresh Mechanism for details.

For investors who want to obtain market data relating to non-position instruments, or set RecalcMode to "off", or be notified when the market data is updated, they can subscribe to them actively. Before actively subscribing to market data, the API parameters should be configured according to the following method (When RecalcMode is set to auto or subscribeOnly, the API will overwrite the following parameters, so do not worry about the setting of API market data parameters). Since no UDP market data is open at YD OMSs, ReceiveUDPMarketData must always be kept at "no", otherwise no market data will be received.

```
ConnectTCPMarketData=yes
ReceiveUDPMarketData=no
```

When ConnectTCPMarketData is set to “yes”, a separate market data thread will be created after API is started. In order to prevent the market data thread from affecting the operation of other threads of the strategy system, the market data thread can be bound to a CPU through configuring API parameters.

```
# Affinity CPU ID for thread to receive TCP market data, -1 indicate no need to set CPU affinity
TCPMarketDataCPUID=-1
```

If the market data is expected to be notified to the strategy program as soon as possible, the working mode of the market data receiving thread can be set:

- When set to -1, the system will be in a busy query state, and the market notification performance is the best, however, the thread will occupy the operation CPU core;
- Investors who do not want the market thread to occupy too much CPU space and do not care about the market data notification performance can set a timeout for the "select" function. The operation under this mode is slower than that under busy query, but the CPU space can be greatly saved. It is suggested that investors set a timeout at the GUI client to reduce unnecessary performance overhead.

```
# Timeout of select() when receiving TCP market data, in millisec. -1 indicates running without select()
TCPMarketDataTimeout=10
```

For a detailed description of the above parameters, refer to Market Data Configuration.

APIs provide the following function for subscribing to and unsubscribing to instrument-based market data. Any actively subscribed instrument-based market data can be queried directly through the market data pointer m_pMarketData mentioned in the above instrument pointer.

```
virtual bool subscribe(const YDInstrument *pInstrument)=0;
virtual bool unsubscribe(const YDInstrument *pInstrument)=0;
```

After the instrument-based market data is updated, investors will be notified through the following callback function.

```
virtual void notifyMarketData(const YDMarketData *pMarketData) {}
```

Parameter	Field	Description
YDMarketData	InstrumentRef	Instrument reference No.
	TradingDay	Current trading day
	PreSettlementPrice	Pre-settlement price
	PreClosePrice	Pre-close price

Parameter	Field	Description
	PreOpenInterest	Unilateral Pre-position volume
	UpperLimitPrice	Upper limit price
	LowerLimitPrice	Lower limit price
	LastPrice	Last price
	BidPrice	Bid price
	AskPrice	Ask price
	BidVolume	Bid volume
	AskVolume	Ask volume
	Turnover	Nominal transaction amount
	OpenInterest	Unilateral position volume
	Volume	Daily trading volume.
	TimeStamp	Millisecond counts from the beginning (17:00) to the order submission time of a trading day. For example: 500 ms past 21:00 in night trading hours: 3600*(21-17)*1000+500 = 14400500 500 ms past 9:00 in day trading hours: 3600*(24+9-17)*1000+500 = 57600500 500 ms past 9:00 in Monday's trading hours: 3600*(24+9-17)*1000+500 = 5760500 For the conversion between YD's timestamp time and reference time, refer to string2TimeStamp and timeStamp2String of ydUtil.h
	AveragePrice	Average opening price
	DynamicBasePrice	Dynamic benchmark price. Please refer to Risk control of price deviation for more details.
	LastTradeTimeStamp	Millisecond counts from the beginning (17:00) to the most recent transaction time of a trading day，only apply to SSE and SZSE。For example: 500 ms past 21:00 in night trading hours: 3600*(21-17)*1000+500 = 14400500 500 ms past 9:00 in day trading hours: 3600*(24+9-17)*1000+500 = 57600500 500 ms past 9:00 in Monday's trading hours: 3600*(24+9-17)*1000+500 = 5760500 For the conversion between YD's timestamp time and reference time, refer to string2TimeStamp and timeStamp2String of ydUtil.h
	m_pInstrument	Order instrument pointer

9. Risk control

The risk control rules of YD can be divided into two categories: before-trade risk control and after-trade risk control.

The before-trade risk control intercepts non-compliant orders and prevent them from reaching the exchange. The before-trade risk control is typically regulatory requirements, and violating them may result in regulatory penalties such as trading restrictions, including self-trades, order cancellation limits and position limits. The before-trade risk control is performed by the OMS before sending instructions to the exchange. If they fail to pass, error notifications will be sent back via the API. Investors using ydExtendedApi can utilize the checkAndInsert series methods to perform local API risk control checks according to the checkAndInsert series methods. If the check results are acceptable, orders can be submitted normally to the OMS. If the check results are unacceptable, the function will return "False". Investors can check ErrorNo within "YDInputOrder" or "YDInputQuote". It's important to note that even if the API performs local risk checks, the OMS still conducts its own risk checks during the order processing.

The after-trade risk control is a concern for brokers or investors themselves. Violation of these risk control rules will increase the risk for both brokers and investors. Because the boundaries of risk control thresholds are relatively lenient, even if there is a slight breach, it will not result in significant changes, such as information volume and other risk control rules. However, if there is a business need to ensure the effectiveness of thresholds under extreme conditions (for example, when investors place orders at very short intervals, and by the time risk control receives the report, it has exceeded the threshold significantly), a stronger risk control threshold can be set to avoid exceeding the threshold too much under extreme conditions. For example, if the business requires a position limit threshold of 100 lots, it can be set to 90, leaving a margin of 10 lots for exceeding. The typical after-trade risk control measures include automatically adjusting the investor's trading permissions or sending risk control alerts.

9.1. Before-trade risk control

9.1.1. Before-trade risk control of open position volume

The risk control of open position volume can be divided into two dimensions: product level and instrument level. Each dimension can independently control the total open position volume, as well as buy-to-open volume and sell-to-open volume. The following example will be explained using the open position volume. The processing methods for risk control of buy-to-open volume and sell-to-open volume are similar.

The risk control rules at the product level involve the aggregation of the open position volume for all instruments belonging to that product. Once the risk control threshold at the product level is triggered, no further open instructions can be sent for all instruments within that product.

The risk control rules at the instrument level aim to perform a risk control for the total open position volume under an instrument. Once the risk control threshold of this instrument level is reached, this instrument will be unavailable for sending open position instructions.

This risk control will not be started after the open position volume reaches the threshold, otherwise, once a new open position order is submitted to an exchange, a value being higher than the risk control threshold will be caused. Therefore, what YD actually controls is a possible open position volume. When an open position order is sent, the possible open position volume of YD will increase, which will not change in case of "pending order". When the final order status is reached, the untraded open position volume can be deducted from the possible open position volume. Therefore, if there are a large number of pending open position orders, the subsequent open position orders will also be rejected due to this risk control.

For each risk control parameter at the product level, refer to OpenLimit and DirectionOpenLimit[2] of YDAccountProductInfo.TradingConstraints[HedgeFlag]. For each risk control parameter at the instrument level, refer to OpenLimit and DirectionOpenLimit[2] of YDAccountInstrumentInfo.TradingConstraints[HedgeFlag]. For field meanings, refer to Risk Control Parameters.

9.1.2. Before-trade trade volume risk control

The risk control of trade volume can be divided into two levels: product level and instrument level.

The risk control rules at the product level aim to perform a risk control for the total bid/ask offset volume under all instruments relating to a product. Once the risk control threshold of this product level is reached, all instruments relating to this product will be unavailable for sending any instruction.

The risk control rules at the instrument level aim to perform a risk control for the total bid/ask offset volume under an instrument. Once the risk control threshold of this instrument level is reached, this instrument will be unavailable for sending any instruction.

This risk control will not be started after the trade volume reaches the threshold, otherwise, once a new order is submitted to an exchange, a value being higher than the risk control threshold will be caused. Therefore, what YD actually controls is a possible trade volume. When an order is sent, the possible trade volume of YD will increase, which will not change in case of "pending order". When the final order status is reached, the untraded order volume can be deducted from the possible trade volume. Therefore, if there are a large number of pending orders, the subsequent orders will also be rejected due to this risk control.

For each risk control parameter at the product level, refer to TradeVolumeLimit of YDAccountProductInfo.TradingConstraints[HedgeFlag]. For each risk control parameter at the instrument level, refer to TradeVolumeLimit of YDAccountInstrumentInfo.TradingConstraints[HedgeFlag] For field meanings, refer to Risk Control Parameters.

9.1.3. Before-trade position volume risk control

The risk control of position volume can be divided into two levels: product level and instrument level. Each level aims to control the position volume, long position volume and short position volume, respectively. Taking the position volume as an example, the processing methods for risk control of long position volume and short position volume are similar.

The risk control rules at the product level aim to perform a risk control for the total long/short position volume under all instruments relating to a product. Once the risk control threshold of this product level is reached, all instruments relating to this product will be unavailable for sending open position instructions.

The risk control rules at the instrument level aim to perform a risk control for the total long/short position volume under an instrument. Once the risk control threshold of this instrument level is reached, this instrument will be unavailable for sending open position instructions.

This risk control will not be started after the position volume reaches the threshold, otherwise, once a new open position order is submitted to an exchange, a value being higher than the risk control threshold will be caused. Therefore, what YD actually controls is a possible position volume. When an open position order is sent, the possible position volume of YD will increase, which will not change in case of "pending order". When the final order status is reached, the untraded order volume can be deducted from the possible position volume. Therefore, if there are a large number of pending open position orders, the subsequent open position orders will also be rejected due to this risk control.

For each risk control parameter at the product level, refer to PositionLimit and DirectionPositionLimit[2] of YDAccountProductInfo.TradingConstraints[HedgeFlag]. For each risk control parameter at the instrument level, refer to PositionLimit and DirectionPositionLimit[2] of YDAccountInstrumentInfo.TradingConstraints[HedgeFlag]. For field meanings, refer to Risk Control Parameters.

9.1.4. Risk control of order cancellation counts

The risk control of order cancellation counts can be divided into two levels: product level and instrument level.

The risk control rules at the product level aim to perform a risk control for the total price-limited order cancellation counts under all instruments relating to a product. Once the risk control threshold of this product level is reached, all instruments relating to this product will be unavailable for sending any instruction.

The risk control rules at the instrument level aim to perform a risk control for the total price-limited order cancellation counts under an instrument. Once the risk control threshold of this instrument level is reached, this instrument will be unavailable for sending any instruction.

This risk control will not be started after the price-limited order cancellation counts reache the threshold, otherwise, once a new order is submitted to an exchange, a value being higher than the risk control threshold will be caused. Therefore, what YD actually controls is a possible order cancellation counts. When a price-limited order is sent, the possible order cancellation counts of YD will increase, which will not change in case of "pending order" or active order cancellation. When all trades are made, one order cancellation count will be deducted. Therefore, if there are a large number of pending price-limited orders, the subsequent price-limited orders will also be rejected due to this risk control.

For each risk control parameter at the product level, refer to CancelLimit of YDAccountProductInfo.TradingConstraints[HedgeFlag]. For each risk control parameter at the instrument level, refer to CancelLimit of YDAccountInstrumentInfo.TradingConstraints[HedgeFlag]. For field meanings, refer to Risk Control Parameters.

9.1.5. Risk control of single order volume

Although the maximum order volumes based on each instrument are control by exchanges, considering that the strategy-specified volumes of some investors are still too large, they should be controlled under the help of OMSs. Therefore, YD supports limiting the maximum volume of orders submitted each time.

Among common risk control parameters, those order volume risk control parameters support setting at three levels i.e. exchange, product, and instrument, respectively:

Level	Field	Description
Exchange	GeneralRiskParamType	Fixed to YD_GRPT_ExchangeMaxOrderVolume
	AccountRef	-1 indicates that it is valid for all investors, otherwise it indicates the user's AccountRef value, which is the account itself for investor account login
	ExtendedRef	Corresponding to YDExchange.ExchangeRef, the only identified exchange
	IntValue1	Upper limit of order volume
Product	GeneralRiskParamType	Fixed to YD_GRPT_ProductMaxOrderVolume
	AccountRef	-1 indicates that it is valid for all investors, otherwise it indicates the user's AccountRef value, which is the account itself for investor account login
	ExtendedRef	Corresponding to YDProduct.ProductRef, the only identified product
	IntValue1	Upper limit of order volume
Instrument	GeneralRiskParamType	Fixed to YD_GRPT_InstrumentMaxOrderVolume
	AccountRef	-1 indicates that it is valid for all investors, otherwise it indicates the user's AccountRef value, which is the account itself for investor account login
	ExtendedRef	Corresponding to YDInstrument.InstrumentRef, the only identified instrument
	IntValue1	Upper limit of order volume

Since the AccountRef under each level involves all accounts or designated accounts, six levels can be formed after pair combination. Their priorities from high to low (a high priority parameter configuration overrides a low priority one) are:

- Instrument level and for designated accounts
- Product level and for designated accounts
- Exchange level and for designated accounts
- Instrument level and for all investors
- Product level and for all investors
- Exchange level and for all investors

9.1.6. Risk control of price deviation

When the difference between the order price and the dynamic base price exceeds the threshold, or when the difference between the order price and the latest price exceeds the threshold, the order will be rejected by the OMS. The dynamic base price differs in different exchanges in terms of value rules:

- For SSE and SZSE, the dynamic base price refers to a trade price generated during the latest call auction under an instrument. If no any trade price is generated during the opening call auction, the previous settlement price should be used as the latest reference price; If no any trade price is generated during the trading call auction, the last trade price generated this call auction should be used as the latest reference price;
- For futures exchanges, if the trade volume in the market data is not 0, the dynamic base price should be the latest one, otherwise, the pre settlement price should be used.

YD directly provides the dynamic base price YDMarketData.DynamicBasePrice in the market data.

This risk control rules involving a large number of parameters can be triggered when meeting any of the following conditions:

- $\text{Order price} \geq \text{dynamic base price} \times (1 + \text{upper deviation ratio limit of dynamic base price})$
- $\text{Order price} \leq \text{dynamic base Price} \times (1 - \text{lower deviation ratio limit of dynamic base price})$
- $\text{Order price} \geq \text{dynamic base price} \times (1 + \text{upper limit of dynamic base price deviating from tick count})$
- $\text{Order price} \leq \text{dynamic base price} \times (1 + \text{lower limit of dynamic base price deviating from tick count})$
- $\text{Order price} \geq \text{latest price} \times (1 + \text{upper deviation ratio limit of latest price})$
- $\text{Order price} \leq \text{latest price} \times (1 - \text{lower deviation ratio limit of latest price})$
- $\text{Order price} \geq \text{latest price} \times (1 + \text{upper limit of latest price deviating from tick count})$
- $\text{Order price} \leq \text{latest price} \times (1 - \text{lower limit of latest price deviating from tick count})$

Due to field constraints, YD needs to synthesize multiple general risk control rules configured for the same product to represent one of its own risk control rules. Since this risk control rule only allows configuration at the global and product level. Setting ExtendedRef to empty indicates that it applies to all products, while setting it to a product name indicates that it only applies to that specific product. and no account is allowed to be designated, the following AccountRef and ExtendedRef are omitted. Please note that it is possible to receive multiple sets of parameters with ExtendedRef being empty and specific products set. Please pay attention to distinguishing between them. The remaining parameters for price deviation are shown in the table below:

Level	Field	Description
Upper deviation ratio limit of dynamic base price	GeneralRiskParamType	Fixed to YD_GRPT_DynamicPriceLimitUpperRatio
	FloatValue	Ratio threshold
Lower deviation ratio limit of dynamic base price	GeneralRiskParamType	Fixed to YD_GRPT_DynamicPriceLimitLowerRatio
	FloatValue	Ratio threshold
Upper limit of dynamic base price deviating from tick count	GeneralRiskParamType	Fixed to YD_GRPT_DynamicPriceLimitUpperTickCount
	IntValue1	tick count
Lower limit of dynamic base price deviating from tick count	GeneralRiskParamType	Fixed to YD_GRPT_DynamicPriceLimitLowerTickCount
	IntValue1	tick count
Upper deviation ratio limit of latest price	GeneralRiskParamType	Fixed to YD_GRPT_DynamicLastPriceLimitUpperRatio
	FloatValue	Ratio threshold
Lower deviation ratio limit of latest price	GeneralRiskParamType	Fixed to YD_GRPT_DynamicLastPriceLimitLowerRatio
	FloatValue	Ratio threshold
Upper limit of latest price deviating from tick count	GeneralRiskParamType	Fixed to YD_GRPT_DynamicLastPriceLimitUpperTickCount
	IntValue1	tick count
Lower limit of latest price deviating from tick count	GeneralRiskParamType	Fixed to YD_GRPT_DynamicLastPriceLimitLowerTickCount
	IntValue1	tick count

Due to 'ExtendedRef' being applicable to all products and specific products, there are two levels in total. Their priority, from high to low (with higher priority overriding lower priority parameter configurations), is as follows:

- Specific products
- All products

9.1.7. Option calling amount

This risk control rule can be used for controlling the option calling amount (total long position cost of options). The long position cost of options is the sum of long position costs of options at corresponding levels (all costs under an account or those costs under an account in an exchange). The long position cost of a single option is the sum of its position details, and the cost of a single position detail is its trade price times the trade volume.

This risk control rule supports the following sub-rules:

- Aggregate calling amount control, which involves controlling the total calling amount by summing up the calling amounts across all exchanges. If the aggregate calling amount exceeds the threshold, order placement on all exchanges will be restricted.
- Single exchange calling amount control, which involves aggregating the calling amounts of individual exchanges. Only when the calling amount of a specific exchange exceeds the threshold will order placement on that exchange be restricted.

The parameters for aggregate calling amount control are shown in the table below:

Level	Field	Description
Global	GeneralRiskParamType	Fixed to YD_GRPT_OptionLongPositionCost

Level	Field	Description
	AccountRef	-1 indicates that it is valid for all investors, otherwise it indicates the user's AccountRef value, which is the account itself for investor account login
	FloatValue	Position cost limit threshold

If ydExtendedApi is used, the position cost threshold of an investor at the global level can be found through YDExtendedAccount.OptionLongPositionCostLimit. The current summarized position cost value of the investor at the global level can also be found through YDExtendedAccount.OptionLongPositionCost.

Since AccountRef involves all accounts or designated accounts, two levels can be covered. Their priorities from high to low (a high priority parameter configuration overrides a low priority one) are:

- For designated accounts
- For all investors

The parameters for single exchange calling amount control are shown in the table below:

Level	Field	Description
Exchange level	GeneralRiskParamType	Fixed to YD_GRPT_ExchangeOptionLongPositionCost
	AccountRef	-1 indicates that it is valid for all investors, otherwise it indicates the user's AccountRef value, which is the account itself for investor account login
	ExtendedRef	It can be set to empty to apply to all exchanges or set to a specific exchange's 'ExchangeRef' to apply only to that particular exchange. 'ExchangeRef' can be obtained from 'YDExchange'.
	FloatValue	Position cost limit threshold

Due to AccountRef being applicable to all accounts or specific accounts, and ExtendedRef being applicable to all exchanges or specific exchanges, there are a total of four levels. Their priorities from high to low (a high priority parameter configuration overrides a low priority one) are:

- For designated accounts, for specific exchanges
- For designated accounts, for all exchanges
- For all investors, for specific exchanges
- For all investors, for all exchanges

9.1.8. Before-trade Message Count Risk Control

To help investors control their maximum message count in advance and to make up for deficiencies in the force of Mssage Count Risk Control, YD implements a preemptive risk control based on the maximum message count. If an order will exceed the maximum message count limit, it will be rejected by the OMS. Refer to Message Count Commission for the method of calculating message count.

> The reason that preemptive risk control based on the OTR message count upper limit cannot be provided is that after reaching a higher OTR level, investors can submit more successful orders to reduce OTR. If orders are forbidden after reaching the OTR, this will cut off the possibility of investors making adjustments themselves. Since the message count is a monotonically increasing number, its maximum value can be limited.

Only when an investor is charged a message count commission on a contract and YDAccountInstrumentInfo.MaxMessage is greater than 0, will the maximum message count of the investor on the contract be controlled. Similar to other preemptive risk controls, this risk control does not start only after the message count of the order reaches the threshold. Otherwise, once a new order is submitted to the exchange, it will exceed the risk control threshold. Therefore, what YD actually controls is the possible message count. When an order is submitted, YD will increase the possible message count. If the order is cancelled, the possible message count does not change. If the order is completely filled, the possible message count is reduced. Therefore, if there are currently a large number of pending orders, subsequent orders may be rejected due to this risk control.

Unlike other preemptive risk controls, this risk control setting is directly converted from CTP daily initial data. As long as the investor's maximum message count risk control is set in CTP, the risk control rule will be automatically set in YD. Similar to CTP, YD also supports mid-session adjustments to the maximum message count. Please contact the administrator if you need to make adjustments during the session.

If the broker adjusts the maximum information volume risk control parameters during trading hours, the API will notify the investor through the following callback function:

```
virtual void notifyUpdateMessageCommissionConfig(const YDUpdateMessageCommissionConfig
*pUpdateMessageCommissionConfig)
```

The field information for 'YDUpdateMessageCommissionConfig' is as follows:

Field	Description
AccountRef	Account reference No. which can be obtained from YDAccount.
ExchangeRef	Exchange reference No. which can be obtained from YDExchange.
ProductRef	Product reference No. which can be obtained from YDProduct.
InstrumentRef	Instrument reference No. which can be obtained from YDInstrumentRef.
MaxMessage	The updated maximum information volume threshold.

9.2. After-trade risk control

9.2.1. After-trade risk control of open position volume

When the total buy-to-open volume of the option series is higher than or equal to the maximum buy-to-open volume, or the sell-to-open volume is higher than or equal to the maximum sell-to-open volume, the "Only position closing allowed" right can be set for all instruments relating to the option series under the account.

The YD after-trade risk control system supports the following six types of risk control:

- Single instrument open position volume limit: Restricts the open position volume of a particular instrument.
- Product instrument open position volume limit: For each instrument under a specified product, restricts the open position volume of individual instruments.
- Exchange instrument open position volume limit: For each instrument under a specified exchange, restricts the open position volume of individual instruments.
- Option series aggregate open position volume limit: Restricts the total open position volume of all instruments under a specified option series.
- Product aggregate open position volume limit: Restricts the total open position volume of all instruments under a specified product.
- Exchange product aggregate open position volume limit: For each product under a specified exchange, restricts the total open position volume of all instruments within that product.

The parameters of this risk control rule are as follows:

Level	Field	Description
Single instrument open position volume limit	GeneralRiskParamType	Fixed to 1019
	AccountID	Funds account
	ExtendedID	Instrument
	IntValue1	Maximum buy-to-open volume
	IntValue2	Maximum sell-to-open volume
Product instrument open position volume limit	GeneralRiskParamType	Fixed to 1020
	AccountID	Funds account
	ExtendedID	Product
	IntValue1	Maximum buy-to-open volume
	IntValue2	Maximum sell-to-open volume
Exchange instrument open position volume limit	GeneralRiskParamType	Fixed to 1021
	AccountID	Funds account
	ExtendedID	Exchange

Level	Field	Description
	IntValue1	Maximum buy-to-open volume
	IntValue2	Maximum sell-to-open volume
Option series aggregate open position volume limit	GeneralRiskParamType	Fixed to 1007
	AccountID	Funds account
	ExtendedID	It can be in the following two formats: Option product code: Option expiration year: Option expiration month Option product code: Underlying instrument code
	IntValue1	Maximum buy-to-open volume
	IntValue2	Maximum sell-to-open volume
Product aggregate open position volume limit	GeneralRiskParamType	Fixed to 1022
	AccountID	Funds account
	ExtendedID	Product
	IntValue1	Maximum buy-to-open volume
	IntValue2	Maximum sell-to-open volume
Exchange product aggregate open position volume limit	GeneralRiskParamType	Fixed to 1023
	AccountID	Funds account
	ExtendedID	Exchange
	IntValue1	Maximum buy-to-open volume
	IntValue2	Maximum sell-to-open volume

There is no overlapping relationship between different types of risk control rules in this rule. If risk control rules are set at multiple levels simultaneously, these rules will take effect concurrently.

At present, the external risk control system is responsible for the execution of this risk control rule. Therefore, investors cannot obtain specific risk control parameter values or determine whether the risk control rules have been triggered through the API.

9.2.2. After-trade risk control of trade volume

When the total trade volume of this option series is greater than or equal to the maximum trade volume, set 'only close' permission for all instruments of this option series in the account.

The YD after-trade risk control system supports the following six types of risk control:

- Single instrument trade volume limit: Restricts the trade volume of a specific instrument.
- Product instrument trade volume limit: For each instrument under a specified product, restricts the trade volume of individual instruments.
- Exchange instrument trade volume limit: For each instrument under a specified exchange, restricts the trade volume of individual instruments.
- Option series aggregate trade volume limit: Restricts the total trade volume of all instruments under a specified option series.
- Product aggregate trade volume limit: Restricts the total trade volume of all instruments under a specified product.
- Exchange product aggregate trade volume limit: For each product under a specified exchange, restricts the total trade volume of all instruments within that product.

The parameters of this risk control rule are as follows:

Level	Field	Description
Single instrument trade volume limit	GeneralRiskParamType	Fixed to 1014

Level	Field	Description
	AccountID	Funds account
	ExtendedID	Instrument
	IntValue1	Maximum trade volume
Product instrument trade volume limit	GeneralRiskParamType	Fixed to 1015
	AccountID	Funds account
	ExtendedID	Product
	IntValue1	Maximum trade volume
Exchange instrument trade volume limit	GeneralRiskParamType	Fixed to 1016
	AccountID	Funds account
	ExtendedID	Exchange
	IntValue1	Maximum trade volume
Option series aggregate trade volume limit	GeneralRiskParamType	Fixed to 1006
	AccountID	Funds account
	ExtendedID	It can be in the following two formats: Option product code: Option expiration year: Option expiration month Option product code: Underlying instrument
	IntValue1	Maximum trade volume
Product aggregate trade volume limit	GeneralRiskParamType	Fixed to 1017
	AccountID	Funds account
	ExtendedID	Product
	IntValue1	Maximum trade volume
Exchange product aggregate trade volume limit	GeneralRiskParamType	Fixed to 1018
	AccountID	Funds account
	ExtendedID	Exchange
	IntValue1	Maximum trade volume

There is no overlapping relationship between different types of risk control rules in this rule. If risk control rules are set at multiple levels simultaneously, these rules will take effect concurrently.

At present, the external risk control system is responsible for the execution of this risk control rule. Therefore, investors cannot obtain specific risk control parameter values or determine whether the risk control rules have been triggered through the API.

9.2.3. After-trade position volume risk control

When the total long position volume of this option series is greater than or equal to the long position volume limit, or when the total short position is greater than or equal to the short position volume limit, set 'only close' permission for all instruments of this option series in the account. If, subsequently, the total position volume becomes less than the position volume limit through closing positions, this rule will not automatically set trading permission. However, if the administrator manually sets it to allow trading permission, the system will not change it back to 'only close' permission.

The YD after-trade risk control system supports the following six types of risk control:

- Single instrument position volume limit: Restricts the position volume of a specific instrument.
- Product instrument position volume limit: For each instrument under a specified product, restricts the position volume of individual instruments.

- Exchange instrument position volume limit: For each instrument under a specified exchange, restricts the position volume of individual instruments.
- Option series aggregate position volume limit: Restricts the total position volume of all instruments under a specified option series.
- Product aggregate position volume limit: Restricts the total position volume of all instruments under a specified product.
- Exchange product aggregate position volume limit: For each product under a specified exchange, restricts the total position volume of all instruments within that product.

The parameters of this risk control rule are as follows:

Level	Field	Description
Single instrument position volume limit	GeneralRiskParamType	Fixed to 1009
	AccountID	Funds account
	ExtendedID	Instrument
	IntValue1	Long position volume limit
	IntValue2	Short position volume limit
Product instrument position volume limit	GeneralRiskParamType	Fixed to 1010
	AccountID	Funds account
	ExtendedID	Product
	IntValue1	Long position volume limit
	IntValue2	Short position volume limit
Exchange instrument position volume limit	GeneralRiskParamType	Fixed to 1011
	AccountID	Funds account
	ExtendedID	Exchange
	IntValue1	Long position volume limit
	IntValue2	Short position volume limit
Option series aggregate position volume limit	GeneralRiskParamType	Fixed to 1005
	AccountID	Funds account
	ExtendedID	It can be in the following two formats: Option product code: Option expiration year: Option expiration month Option product code: Underlying instrument
	IntValue1	Long position volume limit
	IntValue2	Short position volume limit
Product aggregate position volume limit	GeneralRiskParamType	Fixed to 1012
	AccountID	Funds account
	ExtendedID	Product
	IntValue1	Long position volume limit
	IntValue2	Short position volume limit
Exchange product aggregate position volume limit	GeneralRiskParamType	Fixed to 1013
	AccountID	Funds account
	ExtendedID	Exchange
	IntValue1	Long position volume limit

Level	Field	Description
	IntValue2	Short position volume limit

There is no overlapping relationship between different types of risk control rules in this rule. If risk control rules are set at multiple levels simultaneously, these rules will take effect concurrently.

At present, the external risk control system is responsible for the execution of this risk control rule. Therefore, investors cannot obtain specific risk control parameter values or determine whether the risk control rules have been triggered through the API.

9.2.4. Risk control of error order submission counts

Error order submission counts are supervised by exchanges, however, the supervision measures are relatively flexible. In order to avoid this, brokers usually want to control the error order submission counts of investors to exchanges, and even those counts slightly exceeding the limit. Therefore, YD controls the error order submission counts to exchanges through after-trade risk control. When reaching the threshold of error order submission counts, YD's system will set the trading rights of customers to "trade prohibited". Please note that only error orders sent back from exchanges can cause an increase of the total error order submission counts. Those error orders intercepted by the OMSs will not cause an increase of the error order submission counts.

This risk control rule is inaccurate when calculating error order submission counts to exchanges. If ydServer is restarted and the client does not recover it through the HA mode, the error order submissions that occurred during the previous ydServer operation will not be counted.

The global level risk control parameters are shown in the following table:

Level	Field	Description
Global	GeneralRiskParamType	Fixed to 1004
	AccountID	Null indicates that it is valid for all investors, otherwise it indicates the user's AccountID value
	FloatValue	Threshold of error order submission counts

At present, the external risk control system is responsible for executing this risk control rule. Therefore, investors cannot obtain specific risk control parameter values or determine whether the risk control rules have been triggered through the API.

9.2.5. Risk control of trade position ratio

When the trade volume under all instruments relating to a product reaches a certain extent, the ratio of the trade volume to the position volume of the product is not allowed to exceed a certain value, otherwise it will be considered a violation. When the risk control rule is triggered, YD will send a warning to the operators of the broker for their attention, however, no required risk control measures will be taken. This risk control rule is only available for options of SSE and SZSE. This risk control will be set on the counter, and the risk control parameters will also be distributed to the API.

The trade volume refers to the total volume of trades obtained after bid/ask offset under all instruments relating to a product.

The position volume refers to the higher one of the real-time net position volume and net preday position volume under all instruments relating to a product, namely the $max(\text{product total net preday position volume}, \text{product real-time total net position volume})$. The calculation formula for the net position volume under a single instrument is:
$|\text{long position volume} - \text{short position volume}| + \text{long frozen volume} + \text{short frozen volume}$, where the long/short position volumes are the values after deducting the corresponding frozen position volumes. The frozen volume mainly includes positions frozen due to position closing orders and combinations, etc. However, the frozen volume will not be included in the following two cases:

- The current day is the last trading day, and the frozen volume under this instrument is 0;
- When 2 days are left before the expiry date and the combination type relates to bull call spread, bear call spread, bull put spread and bear put spread, the frozen volume of the combination part will not be included, because these combinations will be decombined by exchanges according to the trading rules when settlement is made on the same day.

> Assume that the net preday position volume is 5 lots, currently, the long/short position volumes under Instrument A are 11 lots and 5 lots, respectively, the long/short position volumes under Instrument B are 2 lots and 3 lots, respectively. At this time, for the next bull call spread combination, the first leg refers to the long position volume under Instrument A, the second leg refers to the short position volume under Instrument B, then the position volume calculation process is as follows:
>
> Net real-time position volume under Instrument A = | (11-1) - 5 |+1=5, where the minus one in two brackets refers to the combined frozen position volume

> Net real-time position volume under Instrument B = |2-(3-1)|+1=1, where the minus one in two brackets refers to the combined frozen position volume
>
> Net real-time position volume =5+1=6
>
> Net position volume = max (5,6)=6

The risk control parameters are shown in the following table:

Level	Field	Description
Product	GeneralRiskParamType	Fixed to YD_GRPT_TradePositionRatio
	AccountRef	-1 indicates that it is valid for all investors, otherwise it indicates the user's AccountRef value, which is the account itself for investor account login
	ExtendedRef	It can be set as empty to apply to all products, or a single product's ProductRef can be set to apply only to that specific product. ProductRef can be obtained from YDProduct.
	IntValue1	Trade volume threshold. The trade position ratio can be calculated only when the total trade volume reaches the threshold
	FloatValue	Trade position ratio threshold

Due to AccountRef being applicable to all accounts or specific accounts, and ExtendedRef being applicable to all exchanges or specific exchanges, there are a total of four levels. Their priorities from high to low (a high priority parameter configuration overrides a low priority one) are:

- For designated accounts, for designated exchanges.
- For designated accounts, for all exchanges.
- For all investors, for designated exchanges.
- For all investors, for all exchanges.

Currently, this risk control rule is executed by the ydClient. Investors can view the risk control parameters and risk rule status through ydClient, or obtain risk control parameters through APIs.

9.2.6. Order cancellation/submission ratio risk control

When the sum of order submission counts under all instruments relating to a product reaches a certain extent, (assumed as X), the ratio of the (order cancellation counts - X) / (order submission counts-X) for this product cannot exceed a certain value, otherwise it will be considered a violation. When the risk control rule is triggered, YD will send a warning to the operators of the broker for their attention, however, no required risk control measures will be taken. The order cancellation counts refer to the sum of those under all instruments relating to the product. The order submission counts refer to the sum of those under all instruments relating to the product. This risk control will be set on the counter, and the risk control parameters will also be delivered to the API.

The risk control parameters are shown in the following table:

Level	Field	Description
Product	GeneralRiskParamType	Fixed to YD_GRPT_OrderCancelRatio
	AccountRef	-1 indicates that it is valid for all investors, otherwise it indicates the user's AccountRef value, which is the account itself for investor account login
	ExtendedRef	It can be set as empty to apply to all products, or a ProductRef of a specific product can be set to apply only to that particular product. ProductRef can be obtained from YDProduct.
	IntValue1	The order submission count threshold. The order cancellation / submission ratio is calculated only when the total order submission count reaches the threshold
	FloatValue	Order cancellation / submission ratio threshold

Due to AccountRef being applicable to all accounts or specific accounts, and ExtendedRef being applicable to all exchanges or specific exchanges, there are a total of four levels. Their priorities from high to low (a high priority parameter configuration overrides a low priority one) are:

- For designated accounts, for designated exchanges.

- For designated accounts, for all exchanges.
- for all accounts, for designated exchanges.
- for all accounts, for all exchanges.

Currently, this risk control rule is executed by the ydClient. Investors can view the risk control parameters and risk rule status through ydClient, or obtain risk control parameters through APIs.

9.2.7. After-trade Message Count Risk Control

At present, SHFE, DCE and CZCE manage investors' order placement/cancellation volume through message count control rather than mandatory control to reduce the pressure of invalid orders on exchanges. Many investors are not accustomed to this change, and even some of them may have paid high message count commissions due to failing to control the order volume. Considering that no corresponding message count commission is required on the primary OMS during trading, and its operation characteristics obtained through market-wide summary calculation also make it difficult to calculate message count commission temporarily, YD provides an after-trade risk control measure regarding message count to help brokers and investors reduce the risk on message count commission as much as possible. For the calculation methods of Message Count and OTR (Order to Trade Ratio), please refer to Message Count Commission.

YD provides two different message count control methods, namely, single message count control and message count / OTR control.

For single message count control, as long as the message count exceeds the set thresholds, investors' trading rights under the instrument will be set to "Only position closing allowed" or "Trade prohibited" depending on different thresholds. YD provides before-trade-message-count-risk-control that corresponds to after-trade risk control. When using the before-trade-message-count-risk-control for single message quantity, it is recommended to prioritize the use of before-trade risk control.

The risk control parameters are as follows, which are set in external risk control programs and will not be sent to APIs at present:

Level	Field	Description
Product	GeneralRiskParamType	Fixed to 1001
	AccountID	Funds account
	ExtendedID	Corresponding to YDProduct.ProductID, the only identified product
	IntValue1	message count threshold. The "Only position closing allowed" right can be set under the instrument after being triggered
	IntValue2	message count threshold. The "Trade prohibited" right can be set under the instrument after being triggered

Currently, this risk control rule is executed by an external risk control system, so investors cannot obtain specific risk control parameter values through APIs, nor can they know whether the risk control rule is triggered.

For message count / OTR control, as long as both the OTR and message count exceed the set thresholds, investors' trading rights under the instrument will be set to "Only position closing allowed" or "Trade prohibited" depending on different thresholds. The risk control parameters are as follows:

Level	Field	Description
Product	GeneralRiskParamType	Fixed to 1002
	AccountID	Funds account
	ExtendedID	Corresponding to YDProduct.ProductID, the only identified product
	IntValue1	message count threshold. The "Only position closing allowed" right can be set under the instrument after being triggered
	IntValue2	message count threshold. The "Trade prohibited" right can be set under the instrument after being triggered
	FloatValue	OTR threshold

Currently, this risk control rule is executed by an external risk control system, so investors cannot obtain specific risk control parameter values through APIs, nor can they know whether the risk control rule is triggered.

9.2.8. Position opening not allowed when approaching to expiry date

In order to facilitate brokers to set trading rights for prohibiting position opening under instruments approaching their expiry dates, YD provides a convenient setting method according to after-trade risk control rules.

This risk control rule can be used for checking for reaching the set threshold through YDInstrument.ExpireTradingDayCount. If yes, the "Only position closing allowed" trading right of each investor under the corresponding instrument can be set accordingly.

The parameters of this risk control rule are as follows:

Level	Field	Description
Product	GeneralRiskParamType	Fixed to 1003
	AccountID	Funds account
	ExtendedID	Corresponding to YDProduct.ProductID, the only identified product
	IntValue1	Threshold of days left to expiry date

Currently, this risk control rule is executed by an external risk control system, so investors cannot obtain specific risk control parameter values through APIs, nor can they know whether the risk control rule is triggered.

10. Other

10.1. Password modification

Within the trading session, investors can modify their trading passwords via API. Once modified, the new password will remain valid indefinitely. The method for calling this API is as follows:

```
virtual bool changePassword(const char *username,const char *oldPassword,const char *newPassword)
```

The result of the password modification will be returned through the following callback. If the value of 'errorNo' is zero, it indicates a successful modification. Other values indicate an error occurred, usually due to the incorrect old password(YD_ERROR_OldPasswordMismatch).

```
virtual void notifyChangePassword(int errorNo)
```

10.2. Logging

The YD API, by default, will write logs to the 'log' directory under the path of the executable program. Investors can utilize this mechanism to write their own log information. If the 'log' directory is not found, no log files will be generated.

```
virtual void writeLog(const char *format,...)
```

The logs are split on a daily basis, and typically the API will generate the following log sample.

```
14:59:54 YD API start
14:59:54 version 1.108.36.33
14:59:54 build time Mar  3 2022 17:37:32
14:59:54 build version GCC 10.2.0
14:59:54 TCP trading server 0 connected
```