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Access Solution for Level II Market Data from Hong Kong Node

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Shenzhen Securities Communication Co., Ltd.

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Document Description

Document Name	Access Solution for Level II Market Data from Hong Kong Node
Content Description	Describe the access solution, requirements and recommended user configuration for Level II Market Data from Hong Kong node.

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2017-10-24	1.1	Wang Pengfei	Supplemented multicast address	
2018-12-1	1.2	Wu Fan	Due to the relocation of nodes, the word "Binhai" is changed to "South"	
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2019-08-23	1.4	Wu Fan	Added detailed description of redundancy scheme	
2021-12-31	1.5	Qiu Jinhu	Add the network configuration using Huawei and H3C device	

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Access solution for Transaction System Level II Market Data Hong Kong Node Users

I. Introduction of Transaction System Level II Market Data from Hong Kong Node

Transaction System Level II Market Data ("L2 Market Data") network is an L2 market data network using an independent dedicated network. It carries L2 market data flow, including market data snapshots and individual market data. In the market of mainland China, L2 market data users can only access via LAN lines.

Shenzhen Securities Communication boasts complete securities communication infrastructure, full-fledged functions, and advanced technology. To facilitate foreign investors to invest in the Shenzhen market and promote the prosperity of the Shenzhen-Hong Kong Common Market, we have established the Hong Kong Node for L2 Market Data. Overseas users can access the Hong Kong node via WAN or LAN according to availability.

II. Access solution for Level II Market Data from the Hong Kong Node

2.1 LAN access solution

We have rented the racks at HKT Tseung Kwan O Center to offer access to Shenzhen Stock Exchange L2 Market Data from the Hong Kong Node,. Overseas LAN users can also rent the racks at HKT Tseung Kwan O Center to

access the Shenzhen Stock Exchange L2 market data equipment via LAN lines.

2.2 WAN access solution

Overseas users can also apply for a dedicated WAN line to access Shenzhen Stock Exchange L2 market data from the Hong Kong Node. The recommended bandwidth is 50Mbps. Users can choose a solution according to the actual bandwidth.

2.3 Access redundancy scheme

To reduce the possibility of interruption in a single line, the access plan is recommended as follows:

- Recommended: The user applies for two 50M local lines (or two LAN lines) to access the HKT Tseung Kwan O Center to receive L2 market data, and a 6M WAN line to access HKBN Chaiwan Center to receive L1 market data for backup;
- Optional: The user applies for a 50M local line (or a LAN line) and a 6M WAN line to access HKBN Chaiwan Center to receive L1 market data for backup;
- Optional: The user only applies for two 50M local lines (or two LAN lines) to access HKT Tseung Kwan O Center to receive L2 market data as a backup for each other; when the HKT Tseung Kwan O central node fails, there will be no L1 market data as a backup ;
- Not recommended: Users only apply for a single 50M local line (or a LAN line) to access HKT Tseung Kwan O Center to receive L2 market

data without any backup. The service availability of this plan is 99.6%. The user has to wait for troubleshooting by the operator patiently in case of interruption.

Taking two 50M local lines (or two LAN lines) to access HKT Tseung Kwan O Center as an example. At present, we have two racks, J13 and J14, in the HKT Tseung Kwan O Center. Southen Information Technology Center (South Center) L2 and Futian Center L2 market data are respectively available by connecting to J13 and J14 racks. South Center and Futian Center are the dual-active centers of Shenzhen Stock Exchange. Of the market data from the two centers, users may configure the software to use one source as the primary market data source and the other as the backup. When the primary fails, the software will automatically switch to the backup.

2.4 Access node and access mode

The access node information and recommended bandwidth are shown in Table 1.

Table 1 Details of access node information and recommended bandwidth

Network	Recommended bandwidth	Access node	Location of access node
L2 market data network	LAN user: Network switchover; WAN user: 50M MSTP is recommended	HKT Tseung Kwan O Center	2/F, Internet Application Centre, 22 Chun Cheong Street, Tseung Kwan O Industrial Estate, Sai Kung, New Territories, Hong Kong Rack number: J13 (receiving market data from South Center) J14 (Receiving market data from Futian Center)
L1 market data network(b	6M MSTP is recommended	WTT Chai Wan Center	HKBN Computer Room, 27/F, Sun Wah Fung Centre, 1 On Yip Street, Chai Wan, Hong Kong

ackup is Optional)			Rack number: C11

User access includes the following seven combinations as shown in Table 2:

Table 2 Alternative access methods forL2 Market Data from Hong Kong Node

Access methods user can select	HKT center LAN	HKT center WAN	WTT center leased WAN line （L1 market data）	Recommendation
1	2 lines		1 line	★★★
2		2 lines	1 line	★★★
3	1 line		1 line	★★
4		1 line	1 line	★★
5	2 lines			★★
6		2 lines		★★
7		1 line		★

III. Technical specification for user access

3.1 Type of line access

Users may access the L2 market data network and L1 market data network (backup) through leased MSTP lines. When accessing this type of line, the user's routing equipment has to have a local area network port (LAN port).

3.2 Connection detection function

In order to switch network fast in case of network failure, users should enable and configure BFD (Bidirectional Forwarding Detection) on the routing device to detect network connectivity.

3.3 Routing

3.3.1 Unicast routing and auxiliary features

The unicast routing for users to assess L2 and L1 market data network (backup) uses BGP dynamic routing. Each user has an AS domain. The assigned IP address and AS domain will be different if a user accesses the L1 market data network for backup as the L2 and L1 market data network are physically separated.

3.3.2 Multicast routing and auxiliary features

Our software uses the PIM multicast routing protocol for user access, and each user has to configure every line to sparse-mode.

PIM-SSM mode is used for multicast transmission, therefore the user's operating system from router and switch to host needs to support IGMPv3, and enable the SSM on the network device. The multicast stream will be pushed from the backbone device to the user device. In principle, the user does not have to establish a PIM neighbor relationship with the backbone device.

The technical requirements are summarized in Table 3.

Table 3 Summary of technical requirements

Item	Functions required	Remark
Line access	1. LAN port 2. BFD function	Supported by accessing device
Unicast routing	1. BGP	Supported by accessing device
Multicast routing	1. PIM-Sparse 2. SSM 3. IGMPv3	Accessing device supports PIM-Sparse and SSM; Both the accessing device and the multicast receiving host must support IGMPv3

3.4 Network Security

Users accessing L2 market data network and L1 market data network (backup) should follow the requirements for G3 level in the "Securities and Futures Industry- Testing and Evaluation Requirement for Classified Protection of Information System". Users should use standard-compliant routing equipment for secure access, and perform access control and intrusion prevention.

VI. User configuration guidelines

For example, a user applies for two LAN lines to access the L2 Market Data from Hong Kong Node: (access to L1 market data network is detailed in additional documents)

4.1. IP address information

Table 4 Example of user IP address allocation

User	SZSE internet IP	User internet IP	User LAN segment
Dedicated line A	10.220.1.1/30	10.220.1.2/30	10.219.1.0/27
Dedicated line B	10.220.2.1/30	10.220.2.2/30	10.219.1.0/27

4.2. BGP AS No.

Table 5 Example of user AS number assignment

User	SZSEAS	User AS
Dedicated line A	43101	64515
Dedicated line B	43101	64515

4.3. Re-transmission service IP

Server address	Port	Site
172.27.1.199	7020	Futian

172.27.129.199	7020	South

4.4. Multicast information

Level2-1 Multicast Service: transmission rate of snapshot <= 6.4Mbps, transmission rate of tick data <= 4Mbps. The summit rate of the tick data is about 60,000 per second.
See the Multicast source, Port and Group in below.

Multicast address	Port	Multicast source	Channel type	Site
232.4.105.1	6511	172.27.1.31	Management channel	Futian
232.4.105.2	6512	172.27.129.31	Management channel	South
232.4.105.3	6513	172.27.1.32	Management channel	Futian
232.4.105.4	6514	172.27.129.32	Management channel	South
232.4.105.21	5521	172.27.1.31	Data channel	Futian
232.4.105.22	5522	172.27.129.31	Data channel	South
232.4.105.23	5523	172.27.1.32	Data channel	Futian
232.4.105.24	5524	172.27.129.32	Data channel	South
232.4.105.31	5531	172.27.1.31	Data channel	Futian
232.4.105.32	5532	172.27.129.31	Data channel	South
232.4.105.33	5533	172.27.1.32	Data channel	Futian
232.4.105.34	5534	172.27.129.32	Data channel	South
232.4.105.91	5591	172.27.1.31	Data channel	Futian
232.4.105.92	5592	172.27.129.31	Data channel	South
232.4.105.93	5593	172.27.1.32	Data channel	Futian
232.4.105.94	5594	172.27.129.32	Data channel	South
232.4.105.41	5541	172.27.1.33	Data channel	Futian
232.4.105.42	5542	172.27.129.33	Data channel	South
232.4.105.43	5543	172.27.1.34	Data channel	Futian
232.4.105.44	5544	172.27.129.34	Data channel	South
232.4.105.51	5551	172.27.1.46	Data channel	Futian
232.4.105.52	5552	172.27.129.39	Data channel	South
232.4.105.53	5553	172.27.1.49	Data channel	Futian
232.4.105.54	5554	172.27.129.40	Data channel	South

Level2-2 Multicast Service: transmission rate of snapshot <= 6.4Mbps, transmission rate of tick data <= 15.6Mbps. The summit rate of the tick data is about 240,000 per second.
See the address list, including Multicast source, Port and Group in below.

Multicast address	Port	Multicast source	Channel type	Site
232.4.115.1	6511	172.27.1.31	Management channel	Futian
232.4.115.2	6512	172.27.129.31	Management channel	South
232.4.115.3	6513	172.27.1.32	Management channel	Futian
232.4.115.4	6514	172.27.129.32	Management channel	South
232.4.115.21	5521	172.27.1.31	Data channel	Futian
232.4.115.22	5522	172.27.129.31	Data channel	South

232.4.115.23	5523	172.27.1.32	Data channel	Futian
232.4.115.24	5524	172.27.129.32	Data channel	South
232.4.115.31	5531	172.27.1.31	Data channel	Futian
232.4.115.32	5532	172.27.129.31	Data channel	South
232.4.115.33	5533	172.27.1.32	Data channel	Futian
232.4.115.34	5534	172.27.129.32	Data channel	South
232.4.115.91	5591	172.27.1.31	Data channel	Futian
232.4.115.92	5592	172.27.129.31	Data channel	South
232.4.115.93	5593	172.27.1.32	Data channel	Futian
232.4.115.94	5594	172.27.129.32	Data channel	South
232.4.115.41	5541	172.27.1.33	Data channel	Futian
232.4.115.42	5542	172.27.129.33	Data channel	South
232.4.115.43	5543	172.27.1.34	Data channel	Futian
232.4.115.44	5544	172.27.129.34	Data channel	South
232.4.115.51	5551	172.27.1.46	Data channel	Futian
232.4.115.52	5552	172.27.129.39	Data channel	South
232.4.115.53	5553	172.27.1.49	Data channel	Futian
232.4.115.54	5554	172.27.129.40	Data channel	South

Note: A gateway can receive market data only from the addresses in either the L2-1 Multicast Address List of Market Data Service or from the L2-2 Multicast Address List of Market Data Service, which cannot be mixed. Only the transmission rate of the tick data is different between L2-1 and L2-2, and it is higher of L2-2 than it of L2-1. Market participant can opt to any of them by modify the configuration. No extra fee for Level2-2 data license.

V. Reference configuration for access device (Mainstream brands)

(IP address, AS number, AS password, port number, etc. are subject to actual allocation)

Taking the primary line router connected to the HKT node as an example, and pursuant to the technical requirements for accessing users, the recommended

reference configuration is as follows:

5.1 Juniper device

5.1.1 Interface configuration for access router

set interfaces ge-1/0/0 unit 0 family inet address 10.219.1.1/27 //User's internal interface IP address
set interfaces ge-1/0/1 unit 0 family inet address 10.220.1.2/30 //interface IP for interconnecting with Shenzhen Stock Exchange

5.1.2 Unicast routing configuration for access router

set routing-options router-id 100.1.1.1 //router-id
set routing-options autonomous-system 64515//AS number
set protocols bgp group EBGP type external //Establish EBGP neighbor
set protocols bgp group EBGP peer-as 43101//Peer AS number
set protocols bgp group EBGP neighbor 10.220.1.1 //Establish neighbors with BGP
set protocols bgp group EBGP export internal-to-bgp//Release user addresses to BGP
set protocols bgp group EBGP bfd-liveness-detection minimum-interval 500 //Enable BFD for BGP
set protocols bgp group EBGP bfd-liveness-detection multiplier 3 // Enable BFD for BGP

set routing-options static route 0.0.0.0/0 next-hop 10.219.1.2 //Assume that the user's downlink device interface IP is 10.219.1.2

set policy-options policy-statement internal-to-bgp from route-filter 10.219.1.0/27 exact //Match user routing
set policy-options policy-statement internal-to-bgp then accept //Match user routing

5.1.3 Multicast routing configuration for access router

set protocols igmp interface ge-1/0/0.0 version 3 //Use IGMPV3 for Intranet interface
set protocols pim interface ge-1/0/0.0 mode sparse //Use PIM SM for Intranet interface
set protocols pim interface ge-1/0/1.0 mode sparse // Use PIM SM for WAN interface

5.2 Cisco device

5.2.1 Interface configuration for access router

interface FastEthernet0/1
ip address 10.220.1.2 255.255.255.252 //interface IP for interconnecting with Shenzhen Stock Exchange
bfd interval 500 min_rx 500 multipler3 //enable bfd
interface FastEthernet0/0
ip address 10.219.1.1 255.255.255.224 // User's internal interface IP

5.2.2 Unicast routing configuration for access router

```
Router bgp  64515       //AS number assigned to the user
Bgp router-id X.X.X.X          //ROUTER ID
Neighbor  10.220.1.1  remote-as 43101       //Establish BGP neighbor
Neighbor 10.220.1.1 fail-over bfd                    //bgp switch based on bfd
Network  10.219.1.0 mask 255.255.255.224       //Announce available address for the user
No auto-summary                //Disable auto-summary
Ip route 0.0.0.0 0.0.0.0 10.219.1.2////Assume that the IP of the downlink device interface is 10.229.1.2
```

5.2.3 Multicast routing configuration for access router

```
ip multicast-routing
ip pim ssm default
interface FastEthernet0/0
   ip address 10.219.1.1 255.255.255.224
   ip pim sparse-mode
   ip igmp version 3                                    //Use IGMPV3
interface FastEthernet0/1
   ip address 10.220.1.2 255.255.255.252
   ip pim sparse-mode                                   //Enable PIM
```

5.3 Huawei device

5.3.1 Interface configuration for access router

```
interface GigabitEthernet0/0/1
ip address 10.220.1.2 255.255.255.252   //interface IP for interconnecting with Shenzhen Stock Exchange
Interface GigabitEthernet0/0/0
ip address 10.219.1.1 255.255.255.224 // User's internal interface IP
```

5.3.2 Unicast routing configuration for access router

```
bgp 64515
router-id x.x.x.x
 peer 10.220.1.1 as-number 43101
 Peer 10.220.1.1 password cipher  "bgp authorization pwd"
 Peer 10.220.1.1 bfd min-tx-interval 500 min-rx-interval 500 detect-multiplier 3          //bfd parameter
 Peer 10.220.1.1 bfd enable       //Enable bfd
 ipv4-family unicast
    network 10.219.1.0 255.255.255.224       //Announce available address for the user (should be the local active route)
```

5.3.3 Multicast routing configuration for access router

```
multicast routing-enable
interface GigabitEthernet0/0/1
    ip address 10.220.1.2 255.255.255.252
```

```
pim sm                                          //Enable PIM
Interface GigabitEthernet0/0/0
ip address 10.219.1.1 255.255.255.224
pim sm
igmp enable
igmp version 3                  //enable IGMPV3 for user's internal gateway interface
```

5.4 H3C device

5.4.1 Interface configuration for access router

```
ip address 10.220.1.2 255.255.255.252    //interface IP for interconnecting with Shenzhen Stock Exchange
bfd min-transmit-interval 500
bfd min-receive-interval 500
bfd detect-multiplier 3                  //enable bfd
Interface GigabitEthernet0/0/0
ip address 10.219.1.1 255.255.255.224    // User's internal interface IP
```

5.4.2 Unicast routing configuration for access router

```
bgp 64515
router-id x.x.x.x
 peer 10.220.1.1 as-number 43101
 Peer 10.220.1.1 password cipher  "bgp authorization pwd"
 Peer 10.220.1.1 bfd   //enable bfd
 ipv4-family unicast
    network 10.219.1.0 255.255.255.224   //Announce available address for the user (should be the user's local active route)
```

5.4.3 Multicast routing configuration for access router

```
multicast routing
interface GigabitEthernet0/0/1
 ip address 10.220.1.2 255.255.255.252
 pim sm                                  //Enable PIM
 Interface GigabitEthernet0/0/0
 ip address 10.219.1.1 255.255.255.224
 igmp enable
 igmp version 3              //Use IGMPV3 for   user's internal gateway interface
```