

INFORMATION PAPER
HKEx ORION MARKET DATA PLATFORM
DERIVATIVES MARKET IMPLEMENTATION

January 2013



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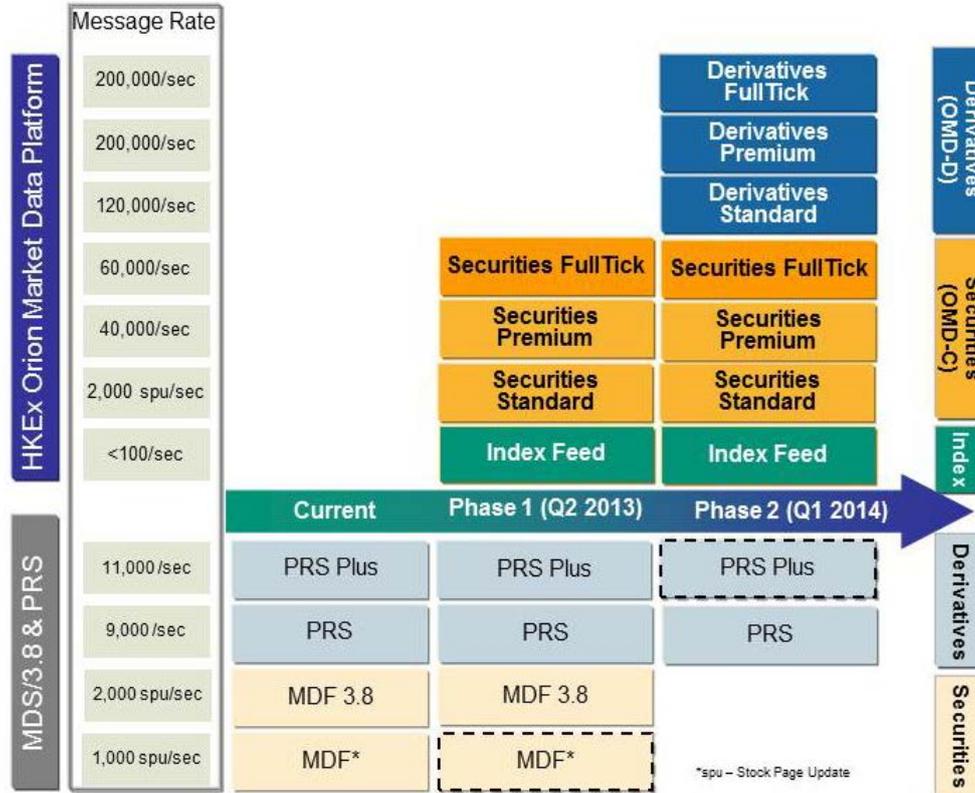
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SECTION 1 INTRODUCTION

- 1.1** HKEx is committed to strengthening the competitiveness of Hong Kong as a leading global financial centre. With this mission, HKEx is investing to revolutionize its core platforms, including connectivity networks, a state-of-the-art data centre, and systems providing order matching, market data dissemination and market access services. A new market data system, namely HKEx Orion Market Data Platform (OMD), will be the first building block of HKEx's next generation core platforms.
- 1.2** OMD is a new and transformative system to disseminate HKEx market data to information vendors, exchange participants and investors. OMD is an integrated low-latency platform delivering market data for all asset classes traded on HKEx markets in a common message format. HKEx believes that the deeper and faster market data will promote the quality and increase the transparency of the market.
- 1.3** OMD will provide new and diversified market datafeed products, with content, depth and bandwidth requirements tailored to suit specific business needs from different types of market participants. OMD also enables HKEx to establish points of presence for market data distribution outside of Hong Kong, such as in Mainland China.
- 1.4** OMD will be rolled out in phases with securities market data (OMD-C) tentatively by Q2 2013 and derivatives market data (OMD-D) tentatively by Q1 2014.
- 1.5** For the derivatives market rollout, OMD-D which sources market data from the upgraded trading system of HKEx derivatives market (HKATS) on Genium INET platform will initially run in parallel with the existing Price Reporting System (PRS). After the transitional period, PRS will be de-commissioned and as a result the existing PRS and PRS Plus feeds will be terminated.
- 1.6** Further to the information paper published on 31 March 2012 giving the overview of the OMD and its implementation in the securities market, this information paper mainly presents the latest OMD project information and the implementation of the OMD in the derivatives market (OMD-D).

SECTION 2 Overview of HKEx Orion Market Data Platform

2.1 Summary of Key Features



2.2 Single Platform for Market Data Distribution of Securities and Derivatives Markets

Currently, HKEx has separate platforms disseminating data from the securities and derivatives markets. OMD is a multi-asset class system which will unify with the distribution of market data in a common message protocol. This single platform approach will increase operational efficiency and reduce maintenance costs for customers subscribing to market datafeeds from both markets.

2.3 New Suite of Market Datafeed Products

Currently, HKEx offers only a limited range of market datafeed products. OMD will introduce new and diversified market datafeed products in terms of content, depth and bandwidth requirements to meet different business needs from market participants. A new suite of datafeed products will be introduced for each market, including conflated market-by-price datafeeds (*Securities Standard* and *Derivatives Standard*), streaming market-by-price datafeeds (*Securities Premium* and *Derivatives Premium*) and streaming

market-by-order datafeeds (Securities *FullTick* and Derivatives *FullTick*). A dedicated datafeed will also be created to distribute index information. The complete suite of market datafeed products on OMD is planned as follows:

Securities Market (OMD-C)

Securities *Standard*

Securities *Premium*

Securities *FullTick*

Index Data (OMD-Index¹)

Index Feed

Derivatives Market (OMD-D)

Derivatives *Standard*

Derivatives *Premium*

Derivatives *FullTick*

Customers may subscribe to one or more of the datafeed products to meet their business needs. They may do so either directly from OMD or indirectly from HKEx authorized information vendors. Each datafeed product will be subject to different market data fees. The OMD Fee Schedule can be found in the [OMD project corner](#) on HKEx website.

2.4 Faster Market Data

OMD employs industry leading low latency technology delivering vital pricing data to customers rapidly and efficiently. OMD will process and disseminate data in sub-millisecond latency.

2.5 Bandwidth

Products will also provide choices in bandwidth requirements. For the most demanding customers, new premium products will stream market data the instance it is created. Lower bandwidth requirements will be met with “conflated” products which provide snapshots of the market in a specified number of messages per second.

¹ OMD-Index is tentatively scheduled to be rolled out with the OMD-C in Q2 2013.

2.6 Depth of Market

OMD will promote market transparency by providing more choices on depth of market. “Market-by-price” feeds will consolidate the order book to the top 10 levels on both the securities and derivatives markets. In addition, new *FullTick* “market-by-order” feeds will provide updates on every order enabling customers to construct a complete order book for instruments of interest.

2.7 Efficient Message Protocol

OMD supports market datafeed products in a binary message protocol which is designed for maximum machine efficiency.

2.8 Deployment of Multicast Technology

OMD delivers market data via multicast transmission allowing for future growth in the number of customers without impact on service level. The mainstream transmission protocol of HKEx’s market datafeed products will be changed from the current unicast to multicast. (Note that remote hubs may continue to adopt unicast due to network constraints.) Data integrity on multicast feeds will be preserved through the use of different mechanisms:

- Line arbitration – Data will be transmitted on two separate lines. Packets dropped or missed on one line can be recovered from the other.
- Data Recovery – If data cannot be recovered through line arbitration (e.g. in the event of a customer application failure or connection failure), then two further mechanisms are provided to enable customers to restore their data images:
 - i. **Retransmission Service:** allows customers to recover lost messages by specifying a starting and ending sequence number of the messages to be recovered. The requested data will then be retransmitted.
 - ii. **Refresh Service:** allows customers to recover the latest market images in case of a prolonged outage on the customer side. The refresh data is provided on a periodic snapshot basis.

SECTION 3 Rollout Phases of HKEx Orion Market Data Platform

3.1 Rollout in Phases

OMD will be rolled out in phases. The tentative schedule is as follows:

<u>Phase No.</u>	<u>Datafeed Products</u>	<u>Rollout Schedule</u>
Phase 1 (a)	Securities Market (OMD-C) Index Data (OMD-Index)	Q2 2013
Phase 1 (b)	Mainland Market Data Hub (MMDH)	Q3 2013
Phase 2	Derivatives Market (OMD-D)	Q1 2014

3.2 Phase 1 (a) – Securities Market and Index Data (OMD-C with OMD-Index)

An information package on the detailed implementation arrangement and schedule was published on 31 July 2012.

3.3 Phase 1 (b) – Mainland Market Data Hub (MMDH)

The first market data hub will be established in Shanghai.

Initially, only securities market and index datafeed products will be offered through the MMDH. The datafeed products to be offered include (a) Securities *Standard* and (b) Index Feed. Provision of more premier datafeed products via the market data hub at a later stage will be subject to market demand.

Interface specification and an Information Sheet for the MMDH was published in December 2012.

3.4 Phase 2 – Derivatives Market (OMD-D)

Datafeed products for derivatives market will be implemented at a later stage, tentatively scheduled for Q1 2014. The detailed product offering and implementation arrangement for derivatives market are covered in Section 5 of this Information Paper.

3.5 Legacy Feeds Decommissioning

Existing market datafeed products (MDF*² and MDF 3.8 for the securities market and PRS and PRS-Plus for the derivatives market), will be phased out shortly after the rollout of the corresponding OMD datafeed products. The phase-out schedule for the existing market datafeed products of different markets is tentatively set as follows:

<u>Datafeed Product</u>	<u>Phase-out Schedule</u>
<i>Securities Market</i>	
- MDF*	Immediate upon the lapse of stabilization period of OMD-C initial rollout
- MDF 3.8	6 months after the initial rollout of OMD-C
<i>Derivatives Market</i>	
- PRS	3 months after the initial rollout of OMD-D
- PRS-Plus	Shortly or immediate upon the lapse of stabilization period of OMD-D initial rollout

For the derivatives market, it is projected that the required data volume capacity will surpass the capacity that can be supported by the existing PRS unicast transmission. Unlike the securities market, the existing unicast derivatives datafeed products, including PRS and PRS-Plus, must therefore be replaced by the OMD-D datafeed products shortly after the OMD-D platform has been successfully rolled out.

Please refer to Section 5 of this Information Paper about the phase-out arrangement for the legacy datafeed products of derivatives market.

² MDF* includes a market depth of 5 levels only, and is transmitted at a slower message rate of 1,000 stock pages update rate per second.

SECTION 4 Derivatives Market Datafeed Products

4.1 Introduction

HKEx will roll out the following datafeed products for derivatives market:

- i. Derivatives *Standard* (DS)
- ii. Derivatives *Premium* (DP)
- iii. Derivatives *FullTick* (DF)

Each of the datafeeds described in this section is provisioned via two separate sets of multicast channels for the Stock Options Market and the Non-Stock Options Markets respectively. Customers can subscribe to only those channels required based on business needs to reduce bandwidth requirements.

For the avoidance of doubt, Stock Options Market (SOM) refers to the market for trading stock options contracts based on single underlying stocks traded on The Stock Exchange of Hong Kong (SEHK) and cleared through the SEHK Options Clearing House Limited (SEOCH). Non-Stock Options Markets (Non-SOM) refer to the markets for trading HKEx derivatives products on Hong Kong Futures Exchange (HKFE) and cleared through the HKFE Clearing Corporation Limited (HKCC). For the latest list of derivative products on HKFE, please refer to the HKEx website.

There is also an optional product available for subscription by the OMD-D customers as elaborated further in Sections 4.5 below.

4.2 Derivatives *Standard*

Derivatives *Standard* (DS) provides Level-2 derivatives market data with market depth up to 10 best price levels (10BBO). DS is positioned as the replacement service to which the existing PRS customers should migrate to. Customers who have been subscribing to PRS may refer to Appendix B for the Key Features Comparison between Derivatives *Standard* and PRS.

In order to ensure that the DS market data content is comparable to that in OAPI, an additional datafeed product, namely Derivatives Trades (DT), which is a streaming trade feed will be offered complimentary to DS customers. The product provides real-time trade and trade amendment / cancellation information. Trades will carry related order

reference identity to allow trading participants to record an execution as well as adjust their order books.

4.3 Derivatives *Premium*

Derivatives *Premium* (DP) is a streaming datafeed tailored for customers demanding faster market data. It provides market-by-price information with Level-2 market depth of 10 best aggregated price levels plus an 11th level showing aggregated liquidity for all remaining orders on the book.

DP is positioned as the datafeed product to replace the PRS Plus feed. Customers who have been subscribing to PRS-Plus may refer to Appendix C for the Key Features Comparison between Derivatives *Premium* and PRS-Plus.

4.4 Derivatives *FullTick*

Derivatives *FullTick* (DF) is a market-by-order datafeed product providing full market transparency. It caters for latency-sensitive customers seeking to conduct algorithmic trading and advanced technical analysis of market data. It carries information of every order³ and trade on a streaming basis.

4.5 Optional Products to OMD-D Customers

4.5.1 Index Feed (OMD-Index)

Recognizing that OMD-D customers may need the underlying index information of those products currently traded on HKFE, OMD Index Feed (OMD-Index), which will be implemented within the same schedule of OMD securities market platform (OMD-C), will be open to OMD-D customers for subscription. OMD-D customers may subscribe to the OMD-Index without additional licence fees⁴.

³ During auction sessions, no order information will be provided via the OMD Derivatives *FullTick*.

⁴ Index Feed is complimentary for the time being. HKEx reserves the right to impose a charge on Index Feed in the future. Information vendors who wish to redistribute the indexes may need to get the corresponding licence from the index compiler directly.

SECTION 5 Derivatives Market Implementation

5.1 Relationship with Genium INET Platform – Exchange Participants’ Consideration and Implementation

As part of HKEx’s technology roadmap, the trading (HKATS) applications for the derivatives market will be upgraded to a new technology platform, Genium INET. OMD-D will source derivatives market data from the new HKATS platform and hence will only be rolled out after the rollout of the new HKATS platform which is tentatively scheduled for Q4 2013.

Under the new HKATS platform, the Exchange Participants who continue using the Network Gateways will continue receiving market data via OMnet Application Program Interface (OAPI). The Exchange Participants who choose to use the Central Gateways may wish to consider sourcing market data either from Network Gateways, OMD-D or indirectly via information vendors because the Central Gateways do not support market data distribution.

For further information about the HKATS Upgrade, please refer to [the Information Paper on HKATS and DCASS Upgrade to Genium INET Platform](#) which is available at HKEx website.

5.2 Price Reporting System (PRS) Roadmap

Significant increases in market transaction volumes are anticipated under the new HKATS platform. Due to technical limitations, in order for PRS to accommodate the high data volumes, the conflation interval of PRS will need to be extended beyond the current 500 milliseconds, possibly up to 5 seconds. The adjustment of conflation interval would be implemented when the new HKATS platform scales up to its capacity tentatively scheduled in Q1 2014 after OMD-D’s rollout. Market rehearsals would be scheduled for PRS customers prior to the release. In any event, PRS will ultimately be discontinued in Q2 2014.

PRS customers who would like to maintain the service level to their customers are hence advised to plan and prepare for their migration to OMD-D accordingly.

5.3 PRS-Plus Roadmap

PRS-Plus faces the same technical limitation as PRS and will not be able to handle the anticipated data volumes of the new HKATS platform without significant extension of the conflation interval. Given that PRS-Plus is positioned as a fast datafeed product, all PRS-Plus customers will need to migrate to OMD-D to achieve the intended service level. PRS-Plus will be discontinued upon the lapse of the 2-week stabilization period of OMD-D's rollout.

PRS-Plus customers are hence advised to take action as soon as possible to ensure they will meet the migration schedule of OMD-D. They may otherwise consider switching to source derivatives market data from other vendors supporting the OMD-D feed.

5.4 Publication of Interface Specifications

Interface Specifications for derivatives market are published together with this information paper on 31 January 2013. With reference to this paper and the Interface Specifications, customers may determine which product(s) can meet their business needs. Customers are advised to assess and ensure they have the necessary expertise and skills to process the selected product(s), and to plan for the corresponding system development and infrastructure setup to interface with OMD-D.

5.5 Enrollment on Datafeed Products

OMD-D datafeed products are tentatively scheduled for rollout by Q1 2014. The enrollment will be commenced from Q1 2013. The OMD Fee Schedule has been announced and is posted on the [OMD project corner](#) on HKEx Website. An information package detailing the enrollment process and implementation arrangement will be issued later in Q1 2013.

5.6 Development of Interface Systems by Customers

As soon as the interface specifications are published, customers are advised to start development on their systems. Customers are welcome to contact the HKEx Vendor Support Team for any document clarification. Technical briefing sessions will be scheduled in due course.

5.7 Availability of On-boarding Tools

In order to assist customers in developing and testing their own systems, a set of on-boarding tools, including canned data, feed handler code skeleton, simulators of real-time data transmission, etc. will be made available later in Q2 2013. With the on-boarding tools, it is expected that customers can effectively test their systems before conducting an end-to-end test in the testing environment of OMD-D.

5.8 Line Installation Ready for End-to-End Test

Customers subscribing to the OMD-D datafeed products should plan for line installation of the new SDNet/2 circuits according to the bandwidth requirement of their selected datafeed(s). Please refer to Appendix A for the bandwidth required for each individual datafeed. Multiple datafeed products may be carried on the same set of SDNet/2 circuits in which case the bandwidth required is the aggregate of the individual bandwidths of each datafeed. As a general guiding principle, customers may share the same set of SDNet/2 circuits for more than one OMD datafeed product across different markets (i.e. OMD-C for securities market, OMD-D for derivatives market or OMD-Index for index data). Exchange Participants who would like to share the same SDNet/2 circuits with trading traffic (orders and trades) and market data traffic are however only allowed to do so if all the traffic on the circuits belongs to the same market (i.e. either securities market or derivatives market). OMD-Index, which is market neutral, can be carried on the same circuits with securities market or derivatives market. For example, Exchange Participants of derivatives market may use the same SDNet/2 circuits for their access to OMD-D DP, OMD-Index and HKATS Central Gateways. Clients who plan to share SDNet/2 circuits should, however, make a thorough technical assessment of the possible operational risks and complexity in troubleshooting (latency, connectivity, etc.) associated with such an approach. Troubleshooting support from HKEx will be limited under such circuit sharing given the increased complexity.

The SDNet/2 circuits should be installed and connected to the testing environment of OMD-D in Q3 2013 to join the end-to-end open test. Customers who wish to join the initial rollout are advised to contact their SDNet/2 network vendor(s) to confirm the line installation in Q2 2013, i.e. 3 months prior to the line installation. Those customers who plan to move into the HKEx Hosting Data Centre (“HDC”) and would like to receive the OMD-D market data from their racks at HDC should contact the Business Development team of HKEx Hosting Services to secure the necessary hosting facilities.

5.9 End-to-end Open Test

To facilitate further system testing by customers, an OMD-D testing environment connecting with the HKATS testing environment will be offered in Q3 2013.

Customers can connect their systems to the OMD-D testing environment to verify the compatibility of their system with OMD-D in an environment analogous to the target production environment. The open environment will be available from 09:00 to 17:00 on Monday to Friday (except public holidays).

5.10 Client Readiness Test

A Client Readiness Test will be conducted in Q4 2013 after the open test to ensure that the customer systems have been properly developed and tested and are able to successfully receive the market data of OMD-D and perform all necessary recovery functions. Customers are required to pass the Client Readiness Test before taking part in the Market Rehearsals to be conducted in early Q1 2014.

5.11 Market Rehearsals

As the final preparation and verification of readiness before production rollout, market rehearsals will be conducted over a number of weekends in early Q1 2014. High trading activities with a large volume of market data will be simulated during the market rehearsals. Customers who wish to subscribe for the OMD-D datafeed products at the initial rollout will be required to join these rehearsals and prove their system readiness.

5.12 Implementation Schedule

The implementation schedule of HKEx Orion Market Data Platform's derivatives market is summarized as follows:

Derivatives Market Implementation	Q1 2013	Q2 2013	Q3 2013	Q4 2013	Q1 2014
Briefing sessions	■	■	■	■	■
Publication of Interface Specifications	■				
Feed Enrollment		■			
Distribution of On-boarding Tools		■			
System Preparation by Customers	■				
Line Installation			■		
Open Test and Certification Test				■	
Market Rehearsals					■
Post-Release Test					■
OMD-D Rollout					■

SECTION 6 Enquiries

For queries and further clarification on the HKEx Orion Market Data Platform – Derivatives Market (OMD-D), please write to:

Hong Kong Exchanges and Clearing Limited
12th Floor, One International Finance Centre
1 Harbour View Street
Central
Hong Kong

Re: OMD-D Implementation

Or Email: OrionMarketData@hkex.com.hk

Appendix A Derivatives Market Datafeed Product Summary

Datafeed Product		Message Rate	Content	Estimated Bandwidth		
				Non-Stock Options Markets	Stock Options Market	Total
1.	Derivatives <i>Standard</i> (DS) - plus <i>Derivatives Trades</i> (DT)	120,000 messages per second	Conflated update on: <ul style="list-style-type: none"> • Level 1 (bid/ask quotations) • Level 2 (market by price with 10 market depths) • Trade statistics <i>Plus complimentary DT:</i> <ul style="list-style-type: none"> • Streaming update on individual trades and trade amendments 	5Mbps	20Mbps	25Mbps
2.	Derivatives <i>Premium</i> (DP)	200,000 messages per second	Streaming update on: <ul style="list-style-type: none"> • Level 1 (bid/ask quotations) • Level 2 (market by price with 10 market depths + 11th aggregating remaining book) • Individual trades and trade amendments 	10Mbps	60Mbps	70Mbps
3.	Derivatives <i>FullTick</i> (DF)	200,000 messages per second	Streaming update on: <ul style="list-style-type: none"> • Market by order information • Individual trades and trade amendments • Auction Session: no order information, but COP & equilibrium volume. 	10Mbps	50Mbps	60Mbps
Optional Product						
1.	OMD-Index ⁵	<100 messages per second	Streaming update (subject to the source) on: <ul style="list-style-type: none"> • Two S&P/HKEx indices; and • Selected indices from CESC, CSIC and HSIL. 			1Mbps

⁵ OMD-Index will be rolled out with OMD-C tentatively in Q2 2013. For the OMD Index interface, customers should refer to the relevant parts of the [Interface Specifications for HKEx Orion Market Data Platform Securities Market Datafeed Products](#) which is available in the [OMD project corner](#) at HKEx website.

Appendix B Key Features Comparison among Derivatives *Standard* and PRS

Derivatives Standard (DS) is positioned as the replacement service for PRS.

DATA CONTENT	Derivatives <i>Standard</i>	PRS
Real-time Data Content	<i>Derivatives market data:</i> <ul style="list-style-type: none"> • Level 2 (market by price with 10 market depths) 	<i>Derivatives market data:</i> <ul style="list-style-type: none"> • Level 2 (market by price with 5 market depths)
TECHNICAL ASPECTS		
Message Update Rate <small>(subject to further upgrade)</small>	120,000 messages per second	9,000 messages per second
Updated interval	Shorter update interval for DS. The time between DS updates is only half of the interval between PRS updates or lower.	
Message Protocol	Binary (proprietary & similar to UTP-MD)	Binary (HKEx proprietary)
Transmission Protocol	Multicast	Unicast
Bandwidth Requirement	25Mbps	5Mbps
Recovery	1) Retransmission (unicast) – recovery of certain or small amount of message lost. 2) Refresh (multicast) – available on a periodic snapshot basis throughout the day. Some bandwidth has been allocated for recovery and so normal data transmission is not affected while Refresh is in progress.	1) Retransmission – recovery from the last received message 2) Completed database download – provide latest market data image for recovery from long service interruption or late connection to PRS.

Appendix C Key Features Comparison among Derivatives *Premium* and PRS-Plus

Derivatives Premium (DP) is positioned as the replacement service for PRS-Plus.

DATA CONTENT	Derivatives <i>Premium</i>	PRS-Plus
Real-time Data Content	<i>Derivatives market data:</i> <ul style="list-style-type: none"> Level 2 (market by price with 10 market depths) 	<i>Derivatives market data:</i> <ul style="list-style-type: none"> Level 2 (market by price with 5 market depths)
Message Update Rate (subject to further upgrade)	200,000 messages per second	11,000 messages per second
Updated interval	Shorter update interval for DP. DP updates is driven by any order changes on streaming basis whilst the interval between PRS-Plus updates is set on a regular interval.	
Message Protocol	Binary (proprietary & similar to UTP-MD)	Binary (HKEx proprietary)
Transmission Protocol	Multicast	Unicast
Bandwidth Requirement	70Mbps	7Mbps
Recovery	3) Retransmission (unicast) – recovery of certain or small amount of message lost. 4) Refresh (multicast) – available on a periodic snapshot basis throughout the day. Some bandwidth has been allocated for recovery and so normal data transmission is not affected while Refresh is in progress.	3) Retransmission – recovery from the last received message 4) Completed database download – provide latest market data image for recovery from long service interruption or late connection to PRS-Plus.

