

Universal Trading Platform Market Data (UTP-MD) Low Bandwidth Solution

European Cash Markets

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1. LOW BANDWIDTH SOLUTION PROCESSING NOTES	4
1.1. Introduction	4
1.1.1. Contact Information	4
1.1.2. Universal Trading Platform Low Bandwidth Solution Overview	4
1.1.3. Reference Material	4
1.2. Compression	5
1.3. Low Bandwidth Solution Bandwidth Limits	5
1.4. Environments	5
2. TECHNICAL MESSAGES – LOW BANDWIDTH SOLUTION SPECIFICS	6
2.1. General Notes	6
2.2. Packet Header Format	6
2.3. SwitchOFF	7
3. PRODUCTION FEED CONFIGURATION	8
3.1. Introduction	8
3.1.1. Data Content	8
3.1.2. Content Delivery	8
3.2. Rendez-Vous Point	8
3.3. Feed Configuration	8
3.3.1. Production Multicast Configuration	8
3.3.2. Message Type per Market	9
3.4. Retransmission Configuration	10
3.4.1. Retransmissions TCP/IP Settings	10
4. EUA FEED CONFIGURATION	11
4.1. Introduction	11
4.1.1. Data Content	11
4.1.2. Data Delivery	11
4.2. Rendez-Vous Point	11
4.3. Feed Configuration	11
4.3.1. EUA Multicast Configuration	11
4.3.2. Message Type per Market	12
4.4. Retransmission Configuration	13
4.4.1. Retransmissions TCP/IP Settings	13
5. CHANGE HISTORY	14
5.1. Version 2.1	14
5.1.1. Document Style and Structure	14
5.1.2. Configuration Changes	14
5.1.3. Additional Information Provided	15
5.2. Version 2.2	15
5.2.1. Addition of BDL, EUA Warrants & Multicast Group Reconfiguration	15
5.3. Version 2.3	16

1. Low Bandwidth Solution Processing Notes

1.1. Introduction

1.1.1. Contact Information

For any questions about this specification please contact the UTP Helpdesk:

Telephone: +33 1 49 27 50 90

Email: utp@nyx.com

1.1.2. Universal Trading Platform Low Bandwidth Solution Overview

The Euronext Cash low bandwidth solution is a compressed real-time market data feed using the UDP multicast protocol.

- The low bandwidth solution is designed for clients dependant on the lower capacity PoP's (point of presence).
- The low bandwidth solution is delivered over a 10Mbps circuit, which is the maximum available over the lower capacity PoP's.
- The content of the low bandwidth solution contains Euronext Equities, Euronext Warrants, Euronext Indices and Bourse De Luxembourg market data.

1.1.3. Reference Material

In order to avoid large amounts of duplication this document highlights the additional information required by developers implementing the low bandwidth solution in comparison to the main Universal Trading Platform Euronext Cash market data feed. In order to complete development of the low bandwidth solution it is essential to review the sections noted below in the Universal Trading Platform Market Data European Cash Markets Specification:

- 1.2.1 – Real Time Market Data
- 1.2.2 – Retransmission Functionality
- 1.3 – Processing Guidelines
- 1.4 – Operational Information
- 1.5 – General Processing Notes (excluding Environment section which is detailed in section 1.4 below for the low bandwidth solution).
- 2 – Technical Message Specifications (excluding Packet Header which is detailed in section 2.2 below for the low bandwidth solution).
- 3 – Real Time Message Specifications

Please note that there is no refresh server functionality with the low bandwidth solution due to bandwidth limitations, therefore any reference to the refresh server and refresh messages in the above specifications should be ignored.

1.2. Compression

The method of compression used in the low bandwidth solution is Zlib. The complete Zlib specifications are available at the following link:

http://www.zlib.net/zlib_docs.html

For an example algorithm to decompress the Zlib format, please contact the UTP Helpdesk.

1.3. Low Bandwidth Solution Bandwidth Limits

In order to ensure market data does not flood the allocated bandwidth without impacting latency by throttling, the broadcasted information related to the Order Book messages (channel 201) may be disabled during the trading day session by Cash Market Surveillance.

Low bandwidth solution clients processing the market sheet (230 messages) will be required on receipt of the 'SwitchOFF Message' detailed in section 2.3 of this document, to switch processing of orderbooks to the quotes / BBO10 messages in the 140 messages.

Low bandwidth solution clients should note that this will affect all Euronext Equities and Bourse De Luxembourg instruments.

1.4. Environments

Two environments are available for clients, all of which have various data products separated into different multicast channels. The environments available, and the different multicast groups available in each (known as Service IDs) are defined as follows for the low bandwidth solution:

- Production

Service ID	Multicast content
'201'	Euronext Equities Orders Bourse De Luxembourg Orders
'202'	Euronext Equities (except orders) Euronext Indices European Stocks Reference Data Bourse De Luxembourg Data (except orders)
'203'	Euronext Warrants Data

- External User Acceptance

Service ID	Multicast content
'11'	Euronext Equities Orders Bourse De Luxembourg Orders
'12'	Euronext Equities Data (except orders) Euronext Indices Euronext Stocks Bourse De Luxembourg Data (except orders) Euronext Warrants Data

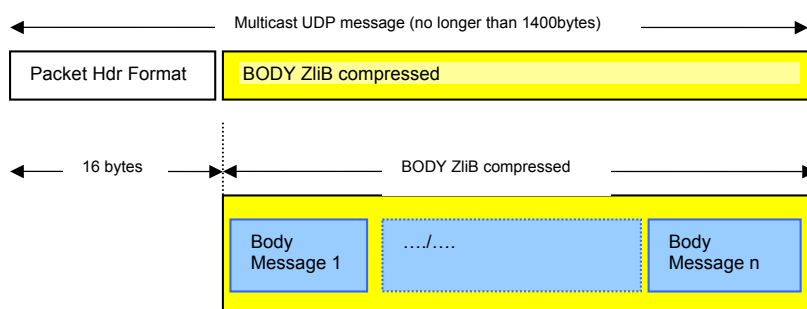
2. Technical Messages – Low Bandwidth Solution Specifics

2.1. General Notes

Consistent with the Universal Trading Platform market data feed, the low bandwidth solution disseminates UDP packets which consist of a 16 byte header and a variable length body containing one or more messages.

The ZLiB compression is only applied to the body of the messages. The packet header is not compressed. This is designed to allow client applications to read the packet header and know to decompress the body of the packet.

The following diagram shows the low bandwidth solution packet structure:



2.2. Packet Header Format

The table below describes the common packet header for the low bandwidth solution.

Field	Offset	Size (Bytes)	Format	Description
PacketLength	0	2	Binary Integer	Length of the packet including the 16-byte packet header.
PacketType	2	2	Binary Integer	Identifier for the type of data contained in the packet. Please refer to section 2.2, 3.1.2, 3.2.2, 3.3.2, 3.4.2, 3.5.2 in the Universal Trading Platform Market Data Cash Markets specification for details of the different values this field can contain.
PacketSeqNum	4	4	Binary Integer	This field contains the packet sequence number. It is unique for each broadcast stream (multicast group) and is used for gap detection. It increases serially and monotonically and is reset to 1 at the beginning of each trading day. The PacketSeqNum is unique for packets containing market data only. Heartbeats inherit their sequence number from the last market data packet or packet sequence number reset packet.
SendTime	8	4	Binary Integer	Timestamp in millisecond indicating the packet broadcast time. The number represents the number of milliseconds since midnight of the last Sunday 00:00 UTC.
ServiceID	12	2	Binary Integer	Numeric value identifying the broadcast stream. Possible values are described in Feed Configuration descriptions
DeliveryFlag	14	1	Binary Integer	Indicates delivery method for the packet payload . 16 - Real Time message (ZLiB compressed) 18 - Retransmission message (ZLiB compressed)

NumberMsgEntries	15	1	Binary Integer	The number of messages that are contained within the packet.
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2.3. *SwitchOFF*

The switchOFF is sent by the low bandwidth solution broadcasting system to inform clients that the NYSE Euronext Equities Order messages will be disabled for the remainder of the trading day. On receipt of this packet, low bandwidth solution clients processing the market sheet (230 messages) should switch to process orderbooks from the quotes (140 messages).

Note that this packet has no body. The fields in the packet header will be filled as follows, the descriptions of which are detailed in section 2.2:

Field	Offset	Size (Bytes)	Format	Description
PacketLength	0	2	Binary Integer	Set to 16 for switchOFF
PacketType	2	2	Binary Integer	Set to 33 for switchOFF
PacketSeqNum	4	4	Binary Integer	As per description in section 2.2 for switchOFF
SendTime	8	4	Binary Integer	As per description in section 2.2 for switchOFF
ServiceID	12	2	Binary Integer	Set to 201 in production for switchOFF, and 11 in EUA for switchOFF
DeliveryFlag	14	1	Binary Integer	Set to 16 for switchOFF (Real Time Message - Zlib Compressed)
NumberMsgEntries	15	1	Binary Integer	Set to 0 for switchOFF

3. Production Feed Configuration

3.1. Introduction

3.1.1. Data Content

The information supplied in this chapter applies to the low bandwidth solution service.

Please note only the sections which differ from the Universal Trading Platform Euronext Cash specifications are detailed below. This specification should be referenced for all other details.

3.1.2. Content Delivery

- The low bandwidth solution is available via SFTI.
- Smartpool and NYSE Arca Europe data is not disseminated via the low bandwidth solution.

3.2. Rendez-Vous Point

Production Platform	
RP1 platform Line A	RP2 Line B
S: 156.48.121.2	S: 156.48.121.55
Associated to: G: 224.0.52.x	Associated to: G: 224.0.53.x

3.3. Feed Configuration

3.3.1. Production Multicast Configuration

The tables below show the UDP/IP configuration for the low bandwidth solution, including line A and line B, for the Production platform.

In this table the following indicators are used:

PS: Primary Data Centre Source IP

SS: Secondary Data Centre Source IP (only used in the event of a disaster recovery situation)

G = Group

P = UDP Port

Service ID	Line A	Line B
'201' – Euronext Equities Orders Bourse De Luxembourg Orders	PS: 156.48.126.120/29 SS: 156.48.125.32/29 G: 224.0.52.23 P: 21066	PS: 156.48.126.112/29 SS: 156.48.125.40/29 G: 224.0.53.23 P: 21067
'202' – Euronext Equities Data (except orders) Euronext Indices European Stocks Bourse De Luxembourg Data (except orders)	PS: 156.48.126.120/29 SS: 156.48.125.32/29 G: 224.0.52.24 P: 21068	PS: 156.48.126.112/29 SS: 156.48.125.40/29 G: 224.0.53.24 P: 21069
'203' – Euronext Warrants Data	PS: 156.48.126.120/29 SS: 156.48.125.32/29 G: 224.0.52.25 P: 21070	PS: 156.48.126.112/29 SS: 156.48.125.40/29 G: 224.0.53.25 P: 21071

3.3.2. Message Type per Market

Packet type	Euronext Equities Orders Bourse De Luxembourg Orders	Euronext Equities Data (except orders) Euronext Indices European Stocks Bourse De Luxembourg Data (except orders)	Euronext Warrants Data
	201	202	203
33 - SwitchOFF	.		
140 - Quotes		.	.
141 - WAS		.	.
220 - Trade - Creation		.	.
221 - Trade - Cancel		.	.
230 - Order Update	.		
231 - Order Retransmission	.		
240 - Trade - Full information		.	.
241 - Trade - Price update		.	.
242 - Trade - TCS trade		.	.
244 - Trade - Settlement price		.	
245 - Trade - Auction summary		.	.
505 - Stock state change		.	.
513 - Euro & Interbank rates		.	.
516 - Group State Change		.	.
523 - Mail		.	.
530 - TOP		.	.
531 - Market Imbalance			
534 - Authorized out of session limits		.	.
535 - TCS State change		.	.
537 - Threshold		.	.
539 - Session timetable		.	.
540 - Display bid & ask		.	.
541 - Daily Summary			
542 - Real-time index		.	
543 - Index Summary		.	
544 - Index composition		.	
550 - Start referential		.	.
551 - End Referential		.	.
553 - Referential		.	.
Bandwidth Size (Kb)	2000	2000	1000
Population *	EE / LU	EE / EI / ES / LU	EW

* Population acronym:

- *EE: Euronext Equities*
- *EW: Euronext Warrants*
- *EI: Euronext Indices*
- *ES: European Stocks*
- *LU: Bourse De Luxembourg*

3.4. Retransmission Configuration

3.4.1. Retransmissions TCP/IP Settings

The table below shows the primary and secondary TCP/IP retransmission address assignments for the low bandwidth solution production platform.

- Primary site (Active)

Production Platform	IP	Port
RTS Address on Primary Server	156.48.126.43	23150
RTS Address on Secondary Server	156.48.126.171	23150

- Secondary site (Disaster Recovery Site)

Production Platform	IP	Port
RTS Address on Primary Server	156.48.125.20	23150
RTS Address on Secondary Server	156.48.125.29	23150

4. EUA Feed Configuration

4.1. Introduction

4.1.1. Data Content

The information supplied in this chapter applies to the low bandwidth solution service.

Please note only the sections which differ from the Universal Trading Platform Euronext Cash specifications are detailed below. This specification should be referenced for all other details.

4.1.2. Data Delivery

- The low bandwidth solution is available via SFTI.
- Smartpool and NYSE Arca Europe data is not disseminated via the low bandwidth solution.

4.2. Rendez-Vous Point

Production Platform	
RP1 platform Line A	RP2 Line B
S: 156.48.121.2	S: 156.48.121.55
Associated to: G: 224.0.52.x	Associated to: G: 224.0.53.x

4.3. Feed Configuration

4.3.1. EUA Multicast Configuration

The tables below show the UDP/IP configuration for the low bandwidth solution, including line A and line B, for the EUA platform.

In this table the following indicators are used:

PS: Primary Data Centre Source IP

G = Group

P = UDP Port

Service ID	Line A	Line B
'11' – Euronext Equities Orders Bourse De Luxembourg Orders	PS: 156.48.126.104/29 G: 224.0.52.22 P: 21064	PS: 156.48.126.96/29 G: 224.0.53.22 P: 21065
'12' – Euronext Equities Data (except orders) Euronext Indices European Stocks Bourse De Luxembourg Data (except orders) Euronext Warrants Data	PS: 156.48.126.104/29 G: 224.0.52.27 P: 21074	PS: 156.48.126.96/29 G: 224.0.53.27 P: 21075

4.3.2. Message Type per Market

Packet type	Euronext Equities Orders Bourse De Luxembourg Orders	Euronext Equities Data (except orders) Euronext Indices European Stocks Bourse De Luxembourg Data (except orders) Euronext Warrants Data
	11	12
33 - SwitchOFF	.	
140 - Quotes		.
141 - WAS		.
220 - Trade - Creation		.
221 - Trade - Cancel		.
230 - Order Update	.	
231 - Order Retransmission	.	
240 - Trade - Full information		.
241 - Trade - Price update		.
242 - Trade - TCS trade		.
244 - Trade - Settlement price		.
245 - Trade - Auction summary		.
505 - Stock state change		.
513 - Euro & Interbank rates		.
516 - Group State Change		.
523 - Mail		.
530 - TOP		.
531 - Market Imbalance		
534 - Authorized out of session limits		.
535 - TCS State change		.
537 - Threshold		.
539 - Session timetable		.
540 - Display bid & ask		.
541 - Daily Summary		
542 - Real-time index		.
543 - Index Summary		.
544 - Index composition		.
550 - Start referential		.
551 - End Referential		.
553 - Referential		.
Bandwidth Size (Kb)	256	256
Population	EE / LU	EE / EI / ES / LU / EW

* Population acronym:

- *EE: Euronext Equities*
- *EW: Euronext Warrants*
- *EI: Euronext Indices*
- *ES: European Stocks*
- *LU: Bourse De Luxembourg*

4.4. Retransmission Configuration

4.4.1. Retransmissions TCP/IP Settings

The table below shows the primary and secondary TCP/IP retransmission address assignments for the low bandwidth solution EUA platform.

- Primary site (Active)

EUA Platform	IP	Port
RTS Address on Primary Server	156.48.126.92	21510
RTS Address on Secondary Server	156.48.126.93	21510

5. Change History

5.1. Version 2.1

5.1.1. Document Style and Structure

The most significant change of the version 2.1 low bandwidth solution specifications is the look and feel of the document. This has been changed to achieve the following:

- Increment the specification from version 1.0 to version 2.1. This has jumped in order to make this specification consistent with the Universal Trading Platform Euronext Cash specification, as this is the key reference point for the low bandwidth solution. Please note that no other document versions have been released in between 1.0 and 2.1.
- Make the document structure consistent with the main Universal Trading Platform Euronext Cash specification.
- Remove duplication between the low bandwidth solution specifications and the Universal Trading Platform Euronext Cash specification. The only details in this document are those which are different to the main specification. The main specification should be used as the key reference point for development of the low bandwidth solution. To this end, some information has been removed from the low bandwidth solution specification when it already exists in the main specification.

5.1.2. Configuration Changes

Configuration changes to the low bandwidth solution have been implemented as described below. Please note that all of these changes are already 'live' in that they will be included from the first day the low bandwidth solution is in production.

Chapter Added / Edited	Description	Impact / Live Date Details
3.3.1	Added details of production secondary data centre source IP addresses	Clients using the source IP details should make the necessary changes for this new configuration. For clients only using multicast groups, this will have no impact as a DR failover will be transparent.
3.4.1	Addition of secondary production retransmission server.	ALL CUSTOMERS SHOULD ADD THIS DETAIL TO THEIR APPLICATION CONFIGURATION. THIS IS MANDATORY FOR HIGH AVAILABILITY RETRANSMISSIONS BEHAVIOR (reference section 4.7.4 of the Universal Trading Platform Cash Markets Specification)
3.4.1	Addition of Disaster Recovery production primary and secondary retransmission server configuration	Clients should add this configuration to their application to be used in the event of a disaster recovery failover to the secondary data

		centre.
4.3.1	Change of EUA source IP details	Clients using the source IP details should make the necessary changes for this new configuration.
4.4.1	Addition of the EUA secondary retransmission server	Clients should add the details of the secondary RTS in EUA in order to test the high availability functionality.

5.1.3. Additional Information Provided

Additional information has been provided in the following sections:

Chapter Added / Edited	Description	Impact / Live Date Details
1.1.3	Reference Material	Additional information provided about references to the Universal Trading Platform Cash Markets Specification
1.3	Low Bandwidth Solution Bandwidth Limits	Additional information to provide context around the use of the SwitchOFF message
2.3	SwitchOFF Message	Related to section 1.3, some additional information provided
3 / 4	Production Configuration Details / EUA Configuration Details	Sections restructured to improve consistency with Universal Trading Platform Cash Markets Specifications.

5.2. Version 2.2

5.2.1. Addition of BDL, EUA Warrants & Multicast Group Reconfiguration

Chapter Added / Edited	Description	Impact / Live Date Details
1.4	Reorganization of Production and EUA environments to consolidate multicast groups.	<p>This is a major configuration change to collapse multicast groups in EUA and Production into 1 group.</p> <p>Customers are required to reconfigure their applications to subscribe to market data</p>

		<p>via this single multicast group (which is the current 201 and 11 group for PRD and EUA). These single groups will support all available market data on the Low Bandwidth Solution.</p> <p>This change will be live as follows:</p> <p>EUA: 19th Oct 2009</p> <p>PRD: 26th Oct 2009</p>
3.3.1 / 4.3.1	<p>Removal of redundant multicast groups 202 and 203 in Production.</p> <p>Removal of redundant multicast group 12 in EUA.</p>	<p>These groups will be removed in line with the change above:</p> <p>EUA: 19th Oct 2009</p> <p>PRD: 26th Oct 2009</p>
3.3.2 / 4.3.2	Consolidation of message types for Euronext Equities, Euronext Warrants, Euronext Indices and Bourse De Luxembourg into one multicast group.	<p>This change will occur in line with the consolidation of multicast groups.</p> <p>EUA: 19th Oct 2009</p> <p>PRD: 26th Oct 2009</p>
3.3.2 / 4.3.2	Addition of Bourse De Luxembourg Data to the Low Bandwidth Solution (Production and EUA).	<p>Luxembourg will use the same message types as currently available in the uncompressed production feed. This will be available as follows:</p> <p>EUA: 19th Oct 2009</p> <p>PRD: 26th Oct 2009</p>
4.3.2	Addition of Euronext Warrants to EUA.	<p>This will be added to EUA as follows:</p> <p>EUA: 19th Oct 2009</p>

5.3. Version 2.3

Chapter Added / Edited	Description	Impact / Live Date Details
1.4	<p>Edited the Production environment to include multicast groups 202 and 203 (as per version 2.1 of the specifications).</p> <p>Edited the EUA environment to include multicast groups 12 (As per version 2.1 of the specifications)</p>	<p>This change will go live on the following dates:</p> <p>EUA: 30th October 2009</p> <p>PRD: 2nd November 2009</p>

3.3.1	Re-added multicast groups 202 and 203 from the version 2.1 specifications.	This change will go live on the following dates: EUA: 30th October 2009 PRD: 2nd November 2009
4.3.1	Re-added multicast groups 12 from the version 2.1 specifications.	This change will go live on the following dates: EUA: 30th October 2009 PRD: 2nd November 2009
3.3.2 / 4.3.2	Re-adjusted the Production and EUA Message Types Per Market to include the new multicast groups.	This change will go live on the following dates: EUA: 30th October 2009 PRD: 2nd November 2009
1.1.3.1	Removed document versioning section as no longer applicable.	No impact – document update only.