



Aquis Stock Exchange Multicast Market Data Technical Specification

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Version 1.1.6



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Version History

Version	Date	Comments
1.0	1 Nov 2019	Initial version
1.1	3 June 2020	Addition of Trade Modify, Quote Add/Replace, Quote Cancel, Trader Definition and Security Statistics message
1.1.1	24 June 2020	Clarification: Trade Modify message published when a trade is cancelled by the Member Correction: Update of field name to traderID in Quote Add/Replace and Quote Cancel messages
1.1.2	27 July 2020	Correction: Data type of traderID in Quote Cancel message Addition of marketFlag in Security Status message
1.1.3	7 Aug 2020	Clarification of messages/feeds which are only applicable to continuous trading
1.1.4	26 Aug 2020	Updated to Bit representation of marketFlags in Security Status message
1.1.5	23 Sept 2020	Clarification of trade reference uniqueness in Real Time Market Data Feed section
1.1.6	05 Oct 2020	Addition of Binary MMT Flags and updated representation of Binary MMT flags in Trades messages Correction of the referred sections



1 Introduction

Aquis Stock Exchange (AQSE) provides its market data to trading Members and market data vendors via a number of IP multicast feeds. These feeds consist of real-time order, quote and trade feeds publishing continuously throughout the trading day and snapshot feeds publishing order book data at regular intervals. Additionally, message replay servers are available to offer message gap recovery if required.

This document describes the protocol and message formats for these continuous trading market data feeds.

1.1 Connectivity

AQSE offers both WAN-shaped and Gig-shaped versions of the market data feed for recipients to use depending on the nature of their connectivity to the AQSE data centres. Furthermore, AQSE offers more than one channel for receiving the market data (for example, two channels from the primary data centre for a particular data stream and a further channel for this stream from the secondary data centre).

The details of the network configuration, multicast address information and login credentials for the replay service, for both production and test feeds, will be provided by the AQSE connectivity team.

1.2 Enquiries / Support

Please contact the AQSE support team at AQSEOperationsSupport@aquis.eu for any questions relating to this document.



2 Service Description

2.1 Real Time Market Data Feed

The AQSE market data servers monitor trading activity on the system and convert these events into market data messages.

This data is anonymised, so that the messages do not include any information identifying the trading Members involved.

Continuous order, quote and trade market data is published using the following messages:

- **Order Add**
- **Order Modify**
- **Order Cancel**
- **Quote Add/Replace**
- **Quote Cancel**
- **Trade Report**
- **Trade Modify**
- **Trade Bust**

Auction on Demand (AoD) phases are published with a separate message:

- **AoD Update**

Order reference numbers are assigned by AQSE and are unique for the day. A particular order reference can appear multiple times on the market data stream and always represents the same order within the trading system. The trade reference is assigned by AQSE and is not unique per trading day, to identify individual trades use both the trade reference and timestamp.

The security identifier on the continuous trading market data messages is a numeric value. AQSE provides a security reference data file for recipients to interpret this security ID, giving information such as RIC, ISIN, currency and MIC for the security. Another reference data file is provided defining the tick tables that apply to the securities. These reference data files are made available for download pre-market open and will be updated daily to reflect securities admitted to or removed from trading and any relevant corporate actions.

Reference data to identify the securities traded on AQSE and to provide tick table information is also published on the feed at the start of the day, before market open, using the following messages:

- **Tick Table Data**
- **Security Definition**
- **Trader Definition**



Note that rarely a **Security Definition** may be published during the trading day if changes or corrections to the data are necessary.

As the trading status of a security changes, either due to market opening or closing or due to AQSE applying a trading halt or regulatory suspension, this update is published using a **Security Status** message.

Each of these messages on a particular feed carries a sequence number for the day's trading session. The first message of the day is sequence number 1, and this value is incremented with each message published on the data feed.

The opening and closing prices will be disseminated using the **Security Statistics** message.

During trading hours, a **Heartbeat** message is sent if no trading data has been published for a period of one second. The Heartbeat message carries the sequence number of the next expected trading data message, and so can be used to detect gaps in periods of low trading activity. It does not itself cause the sequence number of the data stream to be incremented. Heartbeat messages are also sent during periods of technical connectivity pre and post market hours to help recipients check their multicast connectivity.

2.2 Snapshot Feed

This feed is only applicable to continuous trading.

In addition to the continuous real-time feed, an order book snapshot is published at fixed intervals (10 seconds) on a separate feed, providing the full book depth of each traded security.

There is a snapshot feed corresponding to each of the market-split continuous feeds. The first message of each snapshot publication is a **Snapshot Start** message, identifying the sequence number in the continuous stream at the time this snapshot was captured.

For each of these securities, a **Book Status** message is published reporting the status of the security and identifying the number of open orders in that security followed by a series of **Book Entry** messages for each of these orders. If there are currently no open orders for a particular security, then the Book Status message carries an *entries* value of 0 (zero) and there will be no Book Entry messages.

The snapshot feed may be used together with the continuous feed as a way to establish and then maintain a view of the AQSE order book as a starting point for a recipient who has missed the market open and connects during the trading day. The snapshot may be used similarly to recover from an outage and to reconstruct the state of the book on re-connecting to the market data feed.

The snapshot data may also be used by a recipient to verify that they are correctly processing the continuous feed to construct an accurate representation of the order book.



2.3 Replay Service

To allow recipients to recover specific messages that may have been missed from the continuous feed, AQSE offers a TCP/IP replay service for each feed. This service is provided over TCP/IP and recipients wishing to use it should contact AQSE to request login credentials.

On connecting to a replay server, the recipient should send a **Login** message. The server will send back a **Replay Response** indicating acceptance, or else will drop the connection if not authenticated. A connection to a replay server can either be maintained from the beginning of the day or opened as needed.

To recover missed messages, the recipient should send a **Replay Request** message. The replay server validates the request and will respond with the requested range of market data messages. If the request cannot be serviced then a **Replay Response** will be sent to explain the failure of the request.

3 Market Data Message Formats

This section provides details of the message formats used within the AQSE market data feeds. This includes data types, multicast packet header, message header and message fields and descriptions.

3.1 Data Types

In all messages, 1-byte packing is used and all integers are represented in little-endian format.

Data Type	Size	Value
u8	1	unsigned integer 0 – 255
u16	2	unsigned integer 0 – 65,535
u32	4	unsigned integer 0 – 4,294,967,295
u64	8	unsigned integer 0 – $2^{64} - 1$
char(<i>n</i>)	<i>n</i>	Left justified ascii string, padded with zero (0x00) to length <i>n</i>
price	8	unsigned integer representing price with 5 decimal places implied e.g. value 1462500 represents a price of 14.625
timestamp	8	unsigned integer representing elapsed time in nanoseconds* since Unix epoch 00:00 UTC on 1st January 1970

*The AQSE system is accurate to the nearest μ s. This time is multiplied by 1000 to convert μ s to ns.

3.2 Multicast Packet Structure

Each packet on the multicast feeds may carry more than one market data message. The structure is as follows:

- **Packet Header** u8 field message count - number of messages (*n*) in this packet
- **Message 1**
- **Message 2**
- ...
- **Message n**

The sequence number of each message in the feed is carried in the header of the individual market data messages.

The packet header 'message count' and the sequence number of the first message in the packet can be used together to check for dropped packets by recipients of the multicast data streams.

Note that if the packet is carrying a Heartbeat message then the next expected sequence number should not be incremented.

3.3 Message Header and Heartbeat

3.3.1 Message Header

All market data messages carry a standard message header, as follows:

Field Name	Type	Offset	Width	Description
msgType	u8	0	1	Message type identifier
length	u8	1	1	Length of market data message, including header
seqNo	u32	2	4	Sequence number of this message in the market data stream for the current trading day

3.3.2 Heartbeat Message

The Heartbeat message carries no data; it is simply a message header with *msgType* of 1.

As the message carries no business data it does not affect stream sequence number. The *seqNo* field carries the sequence number of the next business data message expected on the multicast stream.

3.4 Continuous Data Feed Messages

3.4.1 Order Add Message

This message is only applicable to continuous trading.

The Order Add message is published when order quantity is posted to the order book for a particular security:

Field Name	Type	Offset	Width	Description
<i>Header</i>		<i>0</i>	<i>6</i>	<i>msgType = 2</i>
securityID	u16	6	2	Numeric identifier of the relevant security
side	u8	8	1	1 = Buy Order, 2 = Sell Order
quantity	u32	9	4	Number of shares being added to the book
price	u64	13	8	The price of the order
orderRef	u32	21	4	Unique order reference number for the day
timestamp	u64	25	8	Timestamp of this market data event

3.4.2 Order Cancel Message

This message is only applicable to continuous trading.

The Order Cancel message is published when a visible order is removed from the book.

The order may have been cancelled by the trading Member or by the AQSE support team, the market may have closed, or the order's time-in-force may have expired.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 3</i>
securityID	u16	6	2	Numeric identifier of the relevant security
orderRef	u32	8	4	Unique order reference number for the day
timestamp	u64	12	8	Timestamp of this market data event

3.4.3 Order Modify Message

This message is only applicable to continuous trading.

The Order Modify message is published when a visible order is modified by the client (change of price and/or quantity). The order reference number remains the same on order modification.

Note that on revision of quantity down the order retains its position in the book, otherwise the book is re-ordered.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 4</i>
securityID	u16	6	2	Numeric identifier of the relevant security
quantity	u32	8	4	Number of shares remaining in the book
price	u64	12	8	The price of the order
orderRef	u32	20	4	Unique order reference number for the day
timestamp	u64	24	8	Timestamp of this market data event

3.4.4 Quote Add/Replace Message

The Quote Add/Replace message is published when a quote is available for a particular security.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 20</i>
traderID	u16	6	2	Numeric identifier of the market maker quoting
securityID	u16	8	2	Numeric identifier of the relevant security

bidQuantity	u32	10	4	Number of available bid shares
bidPrice	u64	14	8	The price of the bid shares
offerQuantity	u32	22	4	Number of available offer shares
offerPrice	u64	26	8	The price of the offer shares
timestamp	u64	34	8	Timestamp of this market data event

3.4.5 Quote Cancel Message

The Quote Cancel message is published when a quote is removed for a particular security.

The quote may have been cancelled by the trading Member or by the Aquis support team or the market may have closed.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 21</i>
traderID	u16	6	2	Numeric identifier of the originator of the quote
securityID	u16	8	2	Numeric identifier of the security
timestamp	u64	10	8	Timestamp of this market data event

3.4.6 Trade Message

Whenever an order trades, partially or fully, a Trade message is published.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 5</i>
securityID	u16	6	2	Numeric identifier of the relevant security
tradeType	u8	8	1	Code identifying type of trade (see below)
quantity	u32	9	4	Number of shares traded
price	u64	13	8	The execution price
orderRef	u32	21	4	Order reference number, for <i>tradeType</i> 1 (visible)
tradeRef	u32	25	4	Trade reference number
timestamp	u64	29	8	Timestamp of this market data event
Binary MMT	u32	37	4	See section 3.4.7 for values

The *tradeType* field is used to identify the category of this trade. Currently assigned codes are as follows, others may be added to correspond to new services or order types:

- 1 = a trade against visible order quantity in the continuous trading order book
- 2 = a trade against hidden or reserve quantity in the continuous trading order book

- 6 = Auction on Demand (AoD) trade
- 8 = Trade Capture Report trade

For a trade against visible order quantity, the traded quantity should be removed from the associated order in the order book. If the order has fully traded then it should be removed from the order book.

Note that if an incoming aggressive order trades against both the visible peak and hidden reserve portions of an iceberg order, this will result in two Trade messages on the feed. The first, for the visible portion, will carry *tradeType* 1 with an associated *orderRef* for the peak. The second, for the reserve portion, will carry *tradeType* 2 and *orderRef* zero as this reserve order quantity was not previously published to the feed. When the iceberg order is refreshed with a new peak, this will be published as an Order Add message with a new *orderRef* value.

3.4.7 Binary MMT Flags

4-byte field representing the applicable MMT flags on Trade messages:

Bit 0 - 2 Market Mechanism	<ul style="list-style-type: none"> 1 - Central Limit Order Book 2 - Quote Driven Market 3 - Dark Order Book 4 - Off Book 5 - Periodic Auction 6 - RFQ 7 - Other
Bit 3 - 6 Trading Mode	<ul style="list-style-type: none"> 1 - Undefined Auction 2 - Opening Auction 3 - Closing Auction 4 - Intraday Auction 5 - Unscheduled Auction 6 - Continuous Trading 7 - At Market Close 8 - Out of Main Session 9 - On-Exchange Trade Reporting A - Off-exchange Trade Reporting B - Systematic Internalizer Trade Reporting
Bit 7 - 9 Transaction Category	<ul style="list-style-type: none"> 1 - Dark trade 2 - Trade that has Received Price Improvement 3 - Package Trade 4 - Exchange for Physicals 5 - None Apply
Bit 10 - 12	0 - Negotiated Trade

Negotiation Indicator or Pre-Trade Transparency Waiver	<ul style="list-style-type: none"> 1 - Negotiated Trade in Liquid Instruments 2 - Negotiated Trade in Illiquid Instruments 3 - Negotiated Trade Other Than Current Market Price 4 - No Negotiated trade 5 - SI Illiquid Instruments 6 - SI Above Standard Market Size 7 - ILQD and SIZE
Bit 13 Crossing Trade	<ul style="list-style-type: none"> 0 - No 1 - Yes
Bit 14 - 15 Modification Indicator	<ul style="list-style-type: none"> 1 - Trade Cancelation 2 - Trade Amendment 3 - New Trade
Bit 16 - 17 Benchmark/Reference Price Indicator	<ul style="list-style-type: none"> 1 - Benchmark Trade 2 - Reference Price Trade 3 - No Benchmark or Ref Price
Bit 18 Dividend	<ul style="list-style-type: none"> 0 - No 1 - Yes
Bit 19 - 20 Off Book Automation	<ul style="list-style-type: none"> 1 - Unspecified 2 - Off-Book Non-Automated 3 - Off-Book Automated
Bit 21 - 23 Price Formation / Discovery Process	<ul style="list-style-type: none"> 1 - Plain Vanilla 2 - Non-price Forming 3 - Trade Not Contributing to Price Discovery 4 - Price Not Currently Available But Pending
Bit 24 Algorithmic Indicator	<ul style="list-style-type: none"> 0 - No 1 - Yes
Bit 25 - 27 Publication Mode – Post-Trade Deferral	<ul style="list-style-type: none"> 1 - Immediate Publication 2 - Non-Immediate Publication 3 - LRGS (Large in Scale) 4 - ILQD (Illiquid Instrument) 5 - SIZE (Size Specific) 6 - ILQD and SIZE 7 - ILQD and LRGS
Bit 28 Deferral Type	<ul style="list-style-type: none"> 0 - None Apply
Bit 29 Duplicative Indicator	<ul style="list-style-type: none"> 0 - Unique 1 - Duplicative
Bit 30 – 31 Spare	N/A

3.4.8 Trade Modify Message

Whenever a previously published transaction is amended or cancelled, a Trade Modify message is published.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 19</i>
securityID	u16	6	2	Numeric identifier of the relevant security
tradeType	u8	8	1	Code identifying type of trade
quantity	u32	9	4	Number of shares traded
price	u64	13	8	The execution price
tradeRef	u32	25	4	Trade reference number of the amended trade
timestamp	u64	29	8	Timestamp of this market data event
origTradeRef	u32	37	4	Trade reference number of the original trade
origTimestamp	u64	41	8	Timestamp of the original trade
Binary MMT	u32	49	4	See section 3.4.7 for values

3.4.9 Trade Bust Message

If a trade has been declared erroneous by AQSE then a Trade Bust message is published.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 6</i>
securityID	u16	6	2	Numeric identifier of the relevant security
quantity	u32	8	4	Number of shares of the original trade
price	u64	12	8	The execution price of the original trade
tradeRef	u32	20	4	Trade reference of the busted trade
timestamp	u64	24	8	Timestamp of this market data event
Binary MMT	u32	32	4	See section 3.4.7 for values

3.4.10 Security Statistics Message

The Security Statistics message is published to disseminate the opening and closing prices of a security.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 22</i>
securityID	u16	6	2	Numeric identifier of the relevant security

price	u64	8	8	Price of security
priceType	u8	16	1	2 = Opening Price 5 = Closing Price
timestamp	u64	17	8	Timestamp of this market data event

3.4.11 Trader Definition Message

A series of Trader Definition messages are published pre-market to identify the quote originators.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 23</i>
traderID	u16	6	2	Numeric identifier of the relevant trader
senderID	char(16)	8	16	SenderID of the trader

3.4.12 Tick Table Data Message

A series of Tick Table Data messages are published pre-market to specify the dynamic tick tables and static ticks that apply to the securities traded on AQSE. This data controls the valid price increments at which orders may be entered onto the AQSE order book.

For dynamic tick tables, there are a set of messages carrying the id and name of the table; these define the tick size (price increment) that applies at increasing price levels. For static ticks there is a single message.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 7</i>
tickTableID	u8	6	1	Numeric identifier for this tick table or static tick
name	char(10)	7	10	Short name
threshold	u64	17	8	The price threshold at which this tick data applies
tickSize	u64	25	8	The tick size (price increment)

3.4.13 Security Definition Message

A series of Security Definition messages are published pre-market to identify the securities traded on AQSE (those relevant to the particular feed e.g. Euronext securities). These messages allow the *securityId* field to be used on later trading related market data messages to associate with a particular security in the recipients system. Note that this message may be sent during the day if a change or correction is necessary for a particular security.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 8</i>
securityID	u16	6	2	Numeric identifier of the relevant security
UMTF	char(6)	8	6	This field is not applicable to AQSE
ISIN	isin	14	12	ISIN for the security
currency	currency	26	3	Trading currency for the security
MIC	mic	29	4	MIC for the security's market of listing
tickTableId	u8	33	1	Numeric identifier for this security's tick table

3.4.14 Security Status Message

The Security Status message is published when the trading status of a security changes or when there is a change to the status of the market on AQSE to which the security belongs.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 9</i>
securityID	u16	6	2	Numeric identifier of the relevant security
tradingStatus	u8	8	1	Possible values: 1 = Active 2 = Halted 3 = Suspended See notes below
marketFlags	u8	9	1	Bit 0 - Trading 0 = Continuous Trading Closed (AoD unavailable) 1 = Continuous Trading Open (AoD available)
				Bit 1 - 2 <i>Reserved</i>
				Bit 3 – pre-open/close 0 = Not a pre phase 1 = Pre phase
				Bit 4 - 7 <i>Reserved</i>
timestamp	u64	10	8	Timestamp of this market data event

The “Pre” flag in *marketFlags* is used to indicate the Pre-Open and Pre-Close market phases.

Bit 0 – Trading	Bit 3 – Pre flag	Market State
0	1	Pre-open
1	0	Open
1	1	Pre-close
0	0	Closed



If a security's *tradingStatus* is 'halted' (by AQSE support for internal reasons) or 'suspended' (for regulatory reasons) then the security cannot be traded. Auctions that are running during a halt or suspension will be cancelled.

If a security's *tradingStatus* is 'active', orders for this security can only be entered if the market for this security on AQSE is open.

3.5 Auction On Demand (AoD) Data Feed Messages

AoD is available during the hours of continuous trading.

3.5.1 AoD Update Message

During the AoD this message is used to publish the indicative price and indicative matched volume. The first AoD update message signals the start of an auction.

Field Name	Type	Offset	Width	Description
Header		0	6	<i>msgType</i> = 17
securityID	u16	6	2	Numeric identifier of the relevant security
indicativePrice	u64	8	8	Indicative auction price
matchVol	u32	16	4	Indicative matched volume
timestamp	u64	20	8	Timestamp of this market data event

When *indicativePrice* = 0 and *matchVol* = 0, this indicates that the auction has finished.

3.5.2 AoD Trade Message

As provided in Section 3.4.6.

3.5.3 AoD Trade Bust Message

As provided in Section 3.4.8.

3.6 Snapshot Feed Messages

3.6.1 Snapshot Start Message

This message is only applicable to continuous trading.

A Snapshot Start message is published as the first message in a snapshot to identify the sequence number in the continuous stream that this snapshot relates to. It also states the number of securities being reported in this snapshot.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 10</i>
streamSeqNo	u32	6	4	The sequence number of the last message in the continuous stream which relates to this snapshot
securityCount	u16	10	2	Number of securities reported in this snapshot
timestamp	u64	12	8	Timestamp of this snapshot

3.6.2 Book Status Message

This message is only applicable to continuous trading.

A Book Status message is published to report the trading and market status of each security and the number of open orders on the order book for the security at the time of the snapshot.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 11</i>
securityID	u16	6	2	Numeric identifier security of relevant security
tradingStatus	u8	8	1	See Section 3.4.13 (Security Status message)
marketFlags	u8	9	1	See Section 3.4.13 (Security Status message)
entries	u16	10	2	Number of open orders in the book for this security
closingBuyQty	u32	12	4	Total order quantity on the buy side during the closing market, otherwise set to 0 (see note 3.4.9)
closingSellQty	u32	16	4	Total order quantity on the sell side during the closing market, otherwise set to 0 (see note 3.4.9)
indicativePrice	u64	20	8	Indicative auction price

3.6.3 Book Entry Message

This message is only applicable to continuous trading.

An appropriate number of Book Entry messages is published after each Book Status message to provide details of each order and allow the book to be built. Orders are published in price, time priority for one side of the book and then the other.

Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 12</i>
securityID	u16	6	2	Numeric identifier security of relevant security
Side	u8	8	1	1 = Buy Order, 2 = Sell Order
quantity	u32	9	4	Number of open shares



Price	u64	13	8	The price of the order
orderRef	u32	21	4	Unique order reference number for the day

3.7 Replay Service Messages

The replay service allows recipients to recover messages that they have missed from the continuous multicast feed via a dedicated TCP/IP connection, as described in Section 2.3.

Note that the *seqNo* field in the standard message header is not relevant for these replay service messages; AQSE will set the field to zero and will ignore the field on messages from data recipients.

3.7.1 Login Message

If a recipient wishes to use the message replay service, they must first be authenticated by sending a Login message to the relevant replay server.

Field Name	Type	Offset	Width	Description
Header		0	6	<i>msgType</i> = 13
username	char(10)	6	10	As assigned by AQSE for the recipient
password	char(10)	16	10	As assigned by AQSE for the recipient

3.7.2 Replay Request Message

The recipient sends a Replay Request message to request a particular message or range of messages from the replay server.

Field Name	Type	Offset	Width	Description
Header		0	6	<i>msgType</i> = 14
beginSeqNo	u32	6	4	Stream seqNo of first message requested
endSeqNo	u32	10	4	Stream seqNo of last message requested

3.7.3 Replay Response Message

AQSE will send a Replay Response message to the recipient to acknowledge a successful Login or to report problems with a Resend Request.

If a Login does not match a valid username or password then the connection is dropped without a response.

If a Resend Request is accepted, AQSE will not send a Replay Response message but will simply send the requested messages over the TCP/IP connection to the recipient.



Field Name	Type	Offset	Width	Description
<i>Header</i>		0	6	<i>msgType = 15</i>
responseCode	u8	6	1	Possible values are: 0 = Login successful 1 = Bad <i>beginSeqNo</i> in Resend Request 2 = Bad <i>endSeqNo</i> in Resend Request