

Encoding and Compression

This document describes Message Templates and FAST encoding & compression algorithms.

RTS Market Data Platform (MDP) Version 5.1.0 implements FAST ('FIX Adapted for Streaming') protocol Version 1.1 of December 20, 2006 and is based on FIX Protocol Version 5.0 Service Pack 1, of March 17, 2008.

Please check <http://www.ficprotocol.org/fast> for detailed FAST encoding/decoding algorithms.

This document describes concepts specific to FAST implementation in MDP; this document is supplementary to the FAST specification referenced above.

Market data broadcast service is based on industry and technology standards including Financial Information Exchange (FIX) protocol for business level messaging, FIX Adapted for Streaming (FAST) protocol for efficient network data distribution and representation, and UDP and IPv4 standards for transmission of broadcast data dissemination.

This approach significantly reduces bandwidth requirements and latency between sender and receiver. FAST extends the base FIX specification and assumes the use of FIX message formats and data structures. FAST is a standalone specification that uses templates to inform the receiver which operations to use in decoding. Templates allow FAST to achieve high levels of data compression with low processing overhead and latency compared to other compression utilities.

Message Templates Overview

A FAST template corresponds to a FIX message type and uniquely identifies an ordered collection of fields. The template also includes syntax indicating the type of field and transfer decoding to apply.

A template is distributed to client systems in XML format using the FAST v1.1 Template Definition Schema maintained by FIX. This XML format is both human- and machine-readable. Appendix 3 of FAST specification contains detailed samples of message templates.

Message templates are stored in standard XML form and can be downloaded from RTS web site. Session Control Protocol (SCP) will not be used for templates dissemination.

Each field in message template refers to corresponding FIX field: id attribute of Template refers to FIX Tag number. Fields retain their original business meaning, data types, possible values and presence requirements until stated otherwise.

Please note that some FIX messages might have several independent FAST templates.

Template Updates

Possible changes in FAST templates are intended to improve data compression. In most cases they will not affect FIX business meaning of messages or fields. If a particular FAST template update leads to incompatibility, MDP clients will be informed beforehand. Once published, templates will never change.

In case of any changes in FAST Templates file, altered templates will receive new IDs; template IDs will not be reused and existing message templates will not be altered.

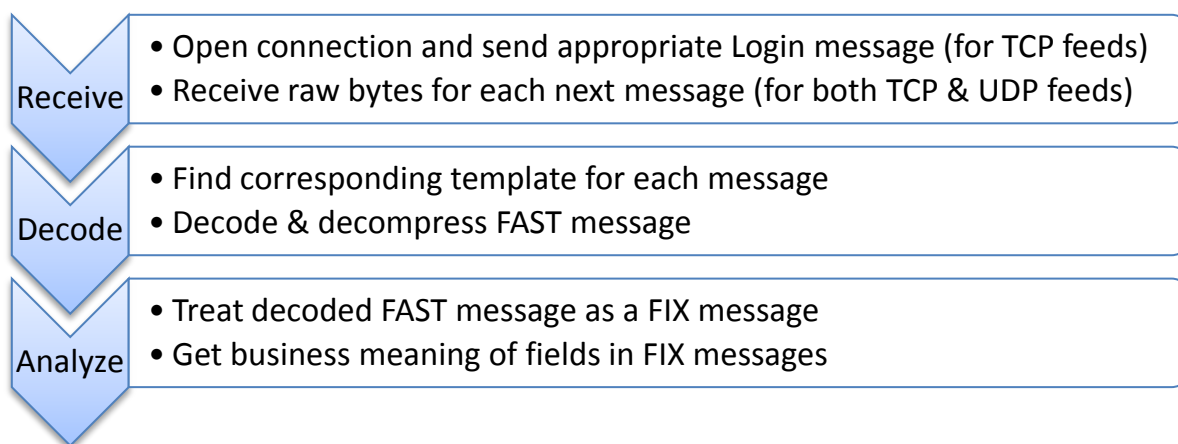
The following algorithm will be used for automatic non-conflicting template updates:

1. New template (with a new ID) will be added to XML file. No messages will use this template.
2. All client systems will download the new template definitions during regular updates.
3. When all client systems are ready to use the new template, MDP will start sending messages using this template.
4. If some old template becomes obsolete, it will be removed from XML file during the next template update cycle.

FAST Implementation Overview

MDP requires that client systems use some software solution to load and interpret templates rather than implement hard-coded templates. Templates will be changed in the future.

Here is a high-level algorithm for message interpretation:



Field Encoding Operators

FAST compares the current value of a field to the prior value of that field (kept in Dictionary) and determines if the new value should be constant, default, copy, delta, increment, or tail.

Dictionary Context for TCP

MDP uses a dictionary context on a per-connection basis for TCP channels. All dictionary entries are implicitly reset to the initial values specified after each connection establishment.

TCP provides reliable, in-order delivery of all messages. So, it is safe to use previous message data for compression.

Dictionary Context for UDP

MDP uses a dictionary context on a per-packed basis for UDP channels. All dictionary entries are reset to the initial values specified when each new UDP packet received. MDP will explicitly send "Reset" message as the first message in a UDP packet. Please note that each UDP packet can contain several FIX/FAST messages.

Data types

A field within a FAST template will have one of the standard Data Types indicating the required decoding action: ASCII string, Unicode string, Signed Integer, Unsigned Integer and Decimal. Decimal exponent and mantissa will be encoded as a single, composite field.

Timestamps mapping

FAST does not natively support timestamps. MDP will convert the timestamp to an integer depending on field type. The decoding application should convert the integer to the FIX UTC format after decoding.

Samples of timestamps encoding

FIX Type	FIX Pattern	Sample FIX value	Sample FAST value	FAST field type
UTC Time Only	HH:MM:SS	18:44:24	184424	uInt32
	HH:MM:SS.sss	18:44:24.123	184424123	uInt32
UTC Date Only	YYYYMMDD	20080812	20080812	uInt32
UTC Timestamp	YYYYMMDD-HH:MM:SS	20080812-18:23:54	1218565434000	uInt64
Month-Year	YYYYMM	200808	200808	uInt32
	YYYYMMDD	20080812	20080812	uInt32

Please note that “UTC Timestamp” is represented as standard Java Date value, representing number of milliseconds from the 1 Jan 1970 00:00:00 UTC.