**FIX**PROTOCOL

INDUSTRY-DRIVEN MESSAGING STANDARD℠

# High Performance Working Group

# Encoding FIX Using ASN.1

**Feb 22, 2013**

**Revision v0.1**

**Proposal Status:  Submitted**

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# Document History

| Revision | Date | Author | Revision Comments |
|----------|------|--------|-------------------|
| v0.1 | 2013-02-01 | Alessandro Triglia | Initial draft |
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# 1 Introduction

## 1.1 Background

The High Performance Working Group was formed with the goal of improving the fit-for-purposefulness of FIX for high performance.

Recent improvements in the speed of hardware, software, and network connections (such as in co-location solutions) are putting pressure on the FIX protocol and highlighting some inefficiencies of the current version of the protocol (e.g., excessive echoing of input values, inefficient encoding). New financial applications such as high-frequency trading and market data feeds pose new performance requirements.  In recent years, several financial organizations have avoided the performance limitations of FIX and introduced new proprietary protocols that are optimized for speed. These proprietary interfaces have been offered, sometimes along with a FIX interface, to support high-speed transactions and/or data feeds.

The current performance limitations of FIX can be removed by making changes and additions at multiple levels of the protocol. At the *application* level, there is a need to define less-verbose versions of some FIX messages and to streamline the message flow. At the *presentation* level, there is a need to provide new encodings that are faster and more compact than the traditional Tag=Value encoding of FIX. At the *session* level, there is a need to specify a new lightweight session protocol with basic recovery options. The High Performance Working Group is drafting a set of specifications and guideline documents to address all these aspects.

## 1.2 ASN.1 Encodings

This proposal entails the use of *ASN.1* (*Abstract Syntax Notation 1*) technology within FIX to produce fast and compact encodings of FIX messages.

The use of ASN.1 is one of the three major approaches to the efficient encoding of FIX that have been developed and are being proposed by the High Performance Working Group—the others being the use of Google's *Protocol Buffers* (GPB) and the use of a new, FIX-specific binary encoding called *Simple Binary Encoding* (SBE). Each of these three encoding mechanisms supports a full mapping of the existing FIX specification to efficient binary messages. However, each encoding mechanism emphasizes different quality characteristics in terms of degree of message compression, performance overhead, flexibility, ease of adoption, and standards conformance. These new encodings are intended to join the ranks of existing FIX encodings—ASCII Tag=Value, FIXML, and FAST, to provide an array of encoding options to support the varying needs of different organizations, while preserving the semantic richness of the FIX interface.

ASN.1 is a family of International Standards for the definition and encoding of messages, jointly developed and published by the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the International Telecommunication Union (ITU). The technical specification draft attached to this proposal contains provisions for the mapping of the content of the FIX Unified Repository to ASN.1.

The mapping to ASN.1 defined in the proposed technical specification can be used for any FIX message (as defined in the FIX Unified Repository), and generates a set of definitions in the ASN.1 notation (i.e., an *ASN.1 schema*). The resulting ASN.1 message definitions can then be encoded by applying standard *encoding rules* to produce efficient binary encodings. ASN.1 has several standard sets of encoding rules that can be used for this purpose, including the *Octet Encoding Rules* (*OER*), the *Basic Encoding Rules* (*BER*), and the *Packed Encoding Rules* (*PER*). Each of these encoding rules has a different balance of encoding/decoding speed, compactness, and self-descriptiveness. A variety of software tools are available on the market that facilitate the development of applications that handle ASN.1 messages. For example, an *ASN.1 compiler* may take an ASN.1 schema as input and generate Java or C/C++ source code automatically.

The source of the mapping to ASN.1 can be either the original FIX Unified Repository or any XML document that resembles the FIX Unified Repository. For example, it can be a subset of the Unified Repository, a custom variant of the Unified Repository, or the result of a formal transformation of the Unified Repository, such as the application of one or more scenarios to some messages in the Unified Repository.  The FIX Basic Repository cannot be used as the source of the mapping for the following reason. Although the two forms of the FIX Repository have equivalent content, they have a different structure (described by different XML schemas), and the proposed mapping specification relies on many aspects of the structure of the Unified Repository.

An introduction to ASN.1 is available on the official ITU website at http://www.itu.int/ITU-T/asn1/introduction/index.htm.

A short tutorial on ASN.1 can be found at http://www.oss.com/asn1/resources/asn1-made-simple/introduction.html.

Other resources about ASN.1, including two freely available books in PDF format, are listed at http://www.oss.com/asn1/resources/books-whitepapers-pubs/asn1-books.html.

The ASN.1 standards (all except the OER standard) can be downloaded for free from the ITU website at http://www.itu.int/ITU-T/recommendations/index.aspx?ser=X. Select the range X.680 to X.699. The most relevant documents are X.680 (basic ASN.1 notation), X.690 (BER), and X.691 (PER).

The OER standard (NTCIP 1102) can be downloaded for free (after registration) from the NTCIP website at http://www.ntcip.org/library/standards/default.asp?documents=yes&standard=1102.

# 2  Business Workflow

It is proposed that the attached technical specification draft ("Encoding FIX Using ASN.1 v0.9.docx") be admitted into the FPL standardization process and eventually be made available to FIX implementers and users.

The proposed technical specification contains provisions for a mapping of the content of the FIX Unified Repository (or any XML document that resembles the FIX Unified Repository) to an ASN.1 schema.

Any FIX message whose ASN.1 definition was generated in accordance with the proposed technical specification can then be encoded by the communicating parties by applying any of the standard encoding rules of ASN.1 (e.g., OER, BER, or PER), which produce binary encodings that are more efficient than the traditional Tag=Value encoding.Since the encodings of ASN.1 are already standardized (some by ISO/ITU, some by other standards organizations) and supported by many commonly available software tools, there is no need for FPL to create its own encoding specification for ASN.1. The mapping to ASN.1 is the only aspect that needs to be standardized within FPL in order to support ASN.1 encodings for FIX, and this is indeed the subject of this proposal.

# 3  Issues and Discussion Points

## 3.1 Production of the Tag=Value encoding from an ASN.1 scheme

Previous drafts of the attached technical specification included additional clauses specifying how to produce a Tag=Value encoding from an ASN.1 schema. It was later agreed to move the relevant clauses into a separate technical specification draft that will be the subject of a future proposal to the GTC.  The attached technical specification is complete as far as the production of binary encodings is concerned.  The additional technical specification that will be proposed in the future will enable user applications using ASN.1 to handle both binary-encoded messages and Tag=Value encoded messages using essentially the same code.

# 4 Proposed Message Flow

This proposal does not include any new message flow. A FIX message encoded in ASN.1 can carry the same information as a FIX message encoded in the Tag=Value encoding.

# 5 FIX Message Tables

This section does not apply to this proposal.

# 6 FIX Component Blocks

This section does not apply to this proposal.

# 7 Category Changes

This section does not apply to this proposal.

# Appendix A - Data Dictionary

This section does not apply to this proposal.

# Appendix B - Glossary Entries

This section does not apply to this proposal.

# Appendix C - Abbreviations

This section does not apply to this proposal.

# Appendix D - Usage Examples

This section does not apply to this proposal.