Simple Binary Encoding

Version 2.0 RC 2

Technical Proposal

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v0.1

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Document History

Revision	Date	Author	Revision Comments
v0.1	Aug. 14, 2019	Don Mendelson Silver Flash LLC	Initial draft

1 Introduction

The High Performance Working Group was formed with the goal of improving the fit-for-purposefulness of FIX for high performance message exchange. The working group has developed multiple standards for the presentation layer (message encoding), including Simple Binary Encoding (SBE). SBE is optimized for ultra-low latency encoding and decoding of messages, orders of magnitude better than typical tag value message processors, and with far more deterministic performance.

SBE is distinguished by these characteristics:

- A binary type system that maps FIX datatypes to native platform types, avoiding unnecessary and costly translation between character-based encodings and types directly usable by computers.
- Deterministic and narrowly targeted message layouts enforced by templates. They enable each use case of an overloaded FIX message type such as ExecutionReport to have its own layout. Each template contains just the required fields for its use case, such as immediate execution. The benefit is reduced message size and reduced optionality. In hardware terms, the result is reduced network bandwidth, reduced memory usage, reduction of cache misses, and less code branching in CPUs. All add up to deterministic performance and low latency. (In fact, "mechanical sympathy" enables hardware-based or accelerated solutions.)
- Just data on the wire. Metadata is exchanged out-of-band as a message schema. This enables pre-processing such as code generation of encoders and decoders rather on-the-fly interpretation.
- An explicit versioning mechanism that allows extension of templates over time without breaking older decoders.

Version 1.0 of SBE was the first FIX standard to complete the full cycle of technical standard process. Due its benefits, SBE v1.0 has gained users both within and beyond the financial industry for low latency applications.

Nevertheless, the user community has requested some important enhancements and pointed out some ambiguities or deficiencies in the original standard. Therefore, we are proposing version 2.0. This effort is Release Candidate 1 of that new version.

1.1 Authors

Name	Affiliation	Contact	Role
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2 Requirements

Requirements added since version 2.0 Release Candidate 1.

2.1 Business Requirements

2.1.1 Single-byte Character Set

SBE Version 1.0 specified the character set for character arrays and single character codes as US-ASCII since specifications for tag value encoding said that FIX is ASCII. This would allow transferring character data between SBE and tag value without character set translation, a computationally expensive operation.

ASCII is a 7-bit character set. (Traditionally, the 8th bit of a byte was used for error detection when networks were very unreliable.) However, it was determined that most FIX engines, including QuickFIX, support 8-bit character sets. Therefore, we changed the specification to allow 8-bit character sets by default rather than restricting to ASCII. It is recommended that ISO/IEC 8859-1:1998 Part 1: Latin Alphabet No. 1 be used by default for Western usage. However, any character set registered with IANA may be used. The SBE message schema provides an attribute for specifying the encoding.

2.2 Technical Requirements

2.2.1 XML Schema Changes

SBE message templates are included in an XML message schema file. The file must conform to an XML schema that is part of the SBE standard.

In RC1, the XML schema had features supported by XML Schema version 1.1. However, even though the standard was published 7 years ago, many XML processors and programming languages do not support its enhancements. Therefore, the SBE schema was reverted to XML Schema version 1.0. Some validations were lost, but this allows SBE to be widely supported across platforms and programming languages.

The SBE schema was enhanced to support XInclude, a standard that allows assembly of a message schema from multiple XML files. This change supports re-use of encoding and message definitions.

3 Issues and Discussion Points

3.1 Resolved Issues

Issues were tracked in GitHub. These issues were resolved and accepted for version 2.0 Release Candidate 2. See issues and pull requests in GitHub for details and changes.

Issue	Description
94	XInclude does not work because of missing xml:base attribute allowance
95	Single-byte character set
96	Package override on type
99	Revert to XML Schema version 1.0
101	update examples section for v2.0RC2
106	Version number in SBE.XSD file name

3.2 Compatibility

Version 2.0 is not interoperable with SBE version 1.0, either in wire format or XML schema. However, converting an existing version 1.0 message schema to version 2.0 is straightforward.

3.3 Usage for non-FIX semantics

SBE is gaining popularity beyond FIX. However, it only describes the mapping of FIX datatypes. We can anticipate that users will want to map other common datatypes for their applications, e.g. IP address, URL, and so forth. SBE is highly flexible as it is, but there may be requests to generalize it beyond its original uses, even outside the financial industry.

4 References

Reference	Version	Relevance	Normative
FIX Simple Binary Encoding Technical Specification	V2.0 RC2		Yes
GitHub project FIXTradingCommunity/fix-simple-binary-encoding		Final specifications as well as working drafts and issue tracking.	

5 Relevant and Related Standards

Related Standard	Version	Reference location	Relationship	Normative

None				

6 Intellectual Property Disclosure

Related Intellection Property	Type of IP (copyright, patent)	IP Owner	Relationship to proposed standard
None			

7 Definitions

Term	Definition

8 Simple Binary Encoding

8.1 Specifications

Full specifications for the Simple Binary Encoding are available in separate document (*FIX Simple Binary Encoding Technical Specification v2.0 RC2*). The standard defines wire format and message schema declaration. The document is a snapshot of drafts now being developed in GitHub project FIXTradingCommunity/fix-simple-binary-encoding.

8.2 Schema

An XML schema (XSD) is provided to standardize XML message schemas. The XSD file sbe-2.0rc2.xsd is publicly available in GitHub project in GitHub project FIXTradingCommunity/fix-simple-binary-encoding.

The XML schema is also served by the address corresponding to its XML namespace, http://fixprotocol.io/2017/sbe/.

Appendix A - Usage Examples

Examples are provided in the specification document.

Appendix B – Compliance Strategy

XML Validation

Message schemas should be validated against the provided XML schema (XSD).

Compliance Test Suite

The FIX technical standard process requires that to be promoted to final specification, a draft standard must have at least two interoperable implementations. A compliance test suite was published publicly in GitHub for SBE version 1.0. By the time version SBE 2.0 reaches draft stage, this compliance test suite must be updated to version 2.0.