FIX Performance Session Layer

Release Candidate 2

Technical Proposal

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v0.3

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Document History

Revision	Date	Author	Revision Comments
v0.1	April 17, 2015	Don Mendelson CME Group	Initial draft
v0.2	April 23, 2015	Don Mendelson CME Group	Added discussion point about session fault tolerance. Various edits.
v0.3	Aug. 19, 2015	Don Mendelson CME Group	Minor corrections

1 Introduction

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.

FIX Performance Session Layer (FIXP) is a lightweight protocol designed to replace FIXT for high performance use cases. It supports both point-to-point exchange of application messages as well as multicasts for market data and the like.

Notable FIXP features:

- Negotiable delivery guarantees, supporting asymmetrical flows
- Separates session identifier from business entity identifiers
- Well isolated from other layers:
    - Binary encoding, but wire format independent for both session and application messages
    - Transport independent; works on TCP streams as well as datagram oriented transports

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2 Requirements

FIXP is contrasted with FIXT, the traditional FIX session layer.

2.1 Business Requirements

2.1.1 Appropriate Delivery Guarantees

FIXP supports common message flow types:

- Recoverable (missed messages are retransmitted)
- Unsequenced (sequencing not needed at the session layer because it is provided at another layer)
- Idempotent (operations guaranteed to be applied only once)
- None (for a one-way flow of messages).

The protocol supports asymmetric flows, such as idempotent orders into a market with recoverable execution reports outbound.

FIXT only supports guaranteed delivery in both directions, whether it is need or not.

2.1.2 Point-to-Point and Multicast Communications

FIXP allows the communication of messages to multiple receivers (multicast) for applications such as market data as well as point-to-point communications.

Although FIXT is theoretically transport-independent, in practice, a FIXT session is bound to a TCP transport, and there are no explicit provisions for multicast.

2.1.3 Session Lifetime

FIXP session creation is cheap, and each session is identified by a statistically unique identifier, distinguished from business entity IDs.

Sessions with recoverable flows have an explicit end of logical flow, as distinguished from simple unbinding of its transport. Sessions that have not reached their logical end may be re-established and re-synchronized.

On the other hand, a non-recoverable session ends when its transport is terminated. Subsequent message exchange is achieved by negotiating a new session with a new session ID.

FIXT has no similar feature for explicit logical flow termination, thus even after a Logout, session messages are still recoverable (implementation dependent).

2.2 Technical Requirements

2.2.1 Performance

The goal of this effort was to create an enhanced session protocol that can provide reliable, highly efficient, exchange of messages to support high performance financial messaging, over a variety of transports.

The protocol shall be fit for purpose for current high message rates, low latency environments in financial markets, but should be to every extent possible applicable to other business domains. There is no reason to limit or couple the session layer to the financial markets / trading business domain without extraordinary reason.

FIXP imposes no requirement on application message format, and implementers are free to use binary encodings for high performance. FIXT requires a verbose character-based header on every message.

2.2.2 Protocol Layering

This standard endeavors to maintain a clear separation of protocol layers, as expressed by the Open Systems Interconnection model (OSI). The responsibilities of a session layer are establishment, termination and restart procedures and rules for the exchange of application messages.

The protocol shall be independent of message encoding (presentation layer), to provide the maximum utility. Encoding independence applies both to session layer messages specified in this document as well as to application messages. It is simpler if session protocol messages are encoded the same way as application messages, but that is not a requirement of this session protocol.

FIXT is tightly bound to tag=value encoding, and it imposes a header on application messages as well as its own session messages.

2.2.3 Message Sequencing

FIXP only sequences application messages, not session layer messages. This makes message recovery deterministic, and by design, sequencing issues do not cause problems with session establishment. On reliable TCP streams the sequencing is implicit after a market message and on unreliable streams such as UDP, the sequencing is per packet.

By contrast, FIXT sequences all messages, including Heartbeat and Logon messages. This makes message recovery non-deterministic and causes complications with failed login attempts on session re-establishment.

3 Issues and Discussion Points

3.1 Security

FIXP does not specify security features for user privacy. If such features are desired, it is recommended that proven mechanisms be employed at other protocol layers, such as a secure transport.

Likewise, the session protocol does not require or recommend a specific authentication protocol. Counterparties are free to agree on user authentication techniques that fit their needs.

3.2 Out-of-Band Recovery

The working group discussed various scenarios for recovery of lost messages via a side channel. This may be required for one-way transports, such as UDP multicast. It may also be desirable for performance reasons to keep recovery out of the critical path of message flow for high performance trading. Although this is achievable with FIXP, we have deferred adding specific features to the protocol to support it until there is a demonstrated need and proven solution.

3.3 Wire Format

Currently, the specification defines messages in an abstract way but leaves details of wire format to specific encodings. Future supplements to the specification may provide templates for FIX binary encodings, including Simple Binary Encoding, ASN.1, or Google Protocol Buffers.

3.4 Session Fault Tolerance

Another area of possible future enhancement is handling of technical faults. FIXP might provide a protocol for fail-over to a backup transport to carry on a trading session, or protocol rules would be defined for firing actions on faults, such as order cancel on disconnect.

4 References

Reference	Version	Relevance	Normative
FIX Performance Session Layer Release Candidate 1 Technical Specification	Final	Full specification as approved for RC1 in September 2014 by the FPL GTC.	
FIX Performance Session Layer Release Candidate 2 Technical Specification	Draft	Submitted to GTC for approval September 1015	

5 Relevant and Related Standards

Related Standard	Version	Reference location	Relationship	Normative
Simple Open Framing Header	RC1		Optional usage at presentation layer	

6 Intellectual Property Disclosure

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

7 Definitions

Term	Definition

8 Deliverables

8.1 Specifications

Full specifications for FIXP are available in separate document *FIX Performance Session Layer: Release Candidate 2 Technical Specification*.

Appendix A - Usage Examples

Examples are provided in the specification document.

Appendix B – Compliance Strategy

Not yet developed.