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FIX orchestra

ISO®

# Through the Looking Glass

## Open Source and Open Standards

FINOS OPEN SOURCE STRATEGY FORUM 2019

*Jim Northey*

*2019-11-20*

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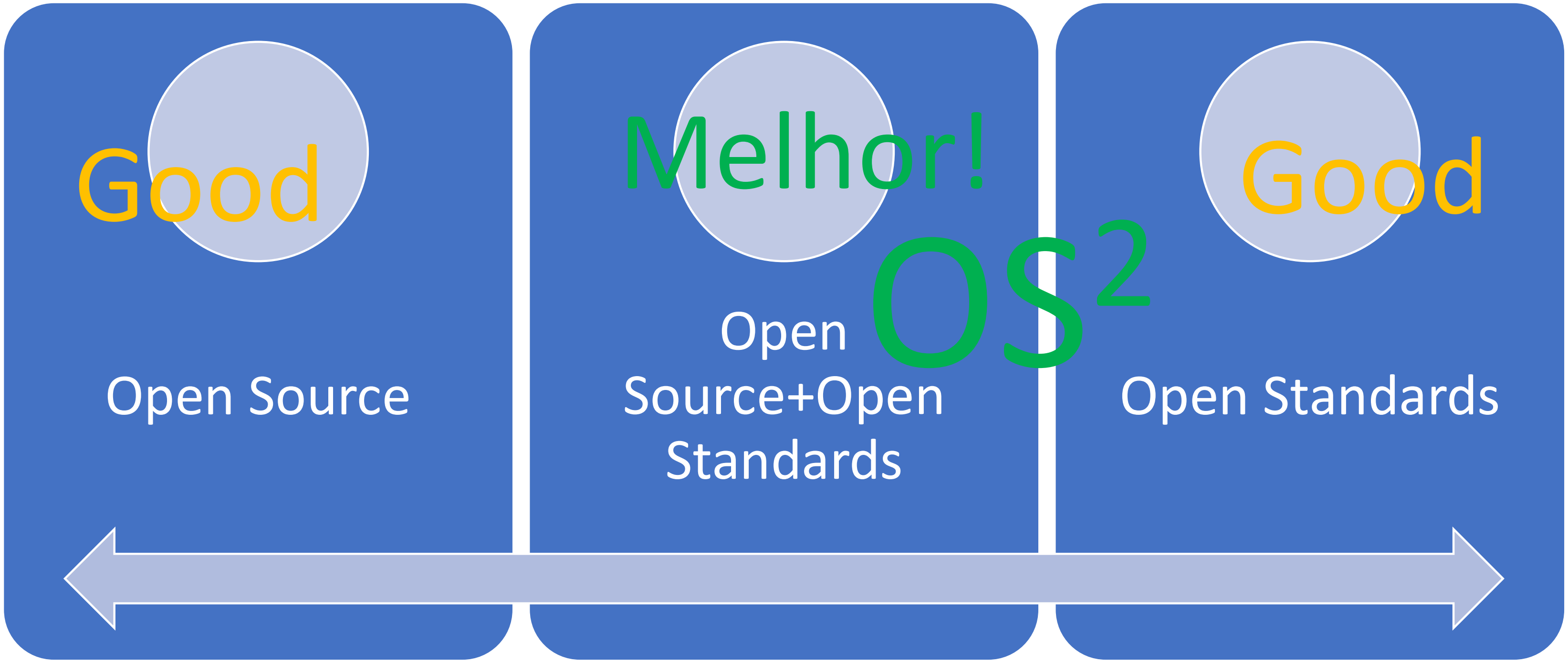
## conjecture...



KARL R. POPPER
CONJECTURES AND REFUTATIONS
THE GROWTH OF SCIENTIFIC KNOWLEDGE
HARPER TORCHBOOKS TB 1376

## Let us now refute...

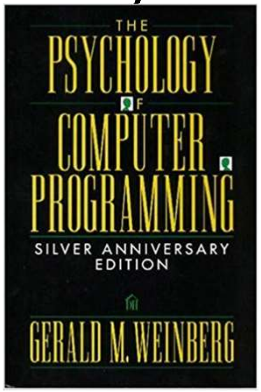
# They are both about Community

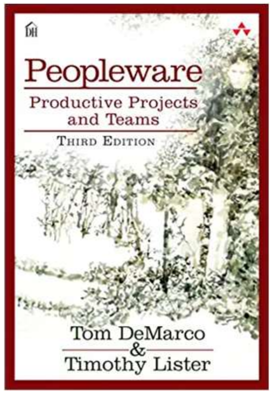
What a bullsh*t obvious statement…

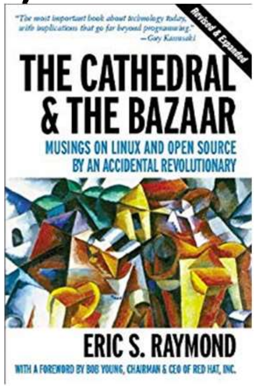
What are you a consultant?

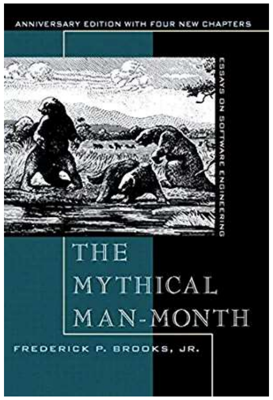
# Social Architecture

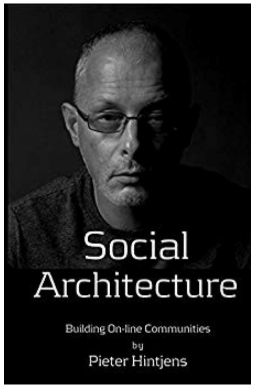
- The Psychology of Computer Programming – Gerald M. Weinberg
- Peopleware by Tom DeMarco & Timothy Lister
- Cathedral and the Bazaar – of course – Eric S. Raymond
- Social Architecture by Peter Hintjens
- The Mythical Man-Month by Frederick P. Brooks Jr.


THE PSYCHOLOGY OF COMPUTER PROGRAMMING
SILVER ANNIVERSARY EDITION
GERALD M. WEINBERG




Revised & Expanded
THE CATHEDRAL & THE BAZAAR
MUSINGS ON LINUX AND OPEN SOURCE BY AN ACCIDENTAL REVOLUTIONARY
ERIC S. RAYMOND
WITH A FOREWORD BY BOB YOUNG, CHAIRMAN & CEO OF RED HAT, INC.


ANNIVERSARY EDITION WITH FOUR NEW CHAPTERS
ESSAYS ON SOFTWARE ENGINEERING
THE MYTHICAL MAN-MONTH
FREDERICK P. BROOKS, JR.



# *…then where to start*

- Compelling problem
- Fairness – a sense of fair play and ***openness***
- Deliver early
- What to do about the free rider problem?

# The Free Rider problem through the looking glass

- Oft studied in Economics
- Through the Looking Glass thinking
  - Where would Linux be without free riders?
    - Microsoft Windows 10 now lets you install a Linux subsystem
- Is it a free rider *problem* or a free rider ***opportunity***
- A look at the history of QuickFIX

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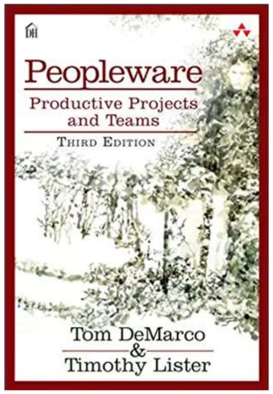
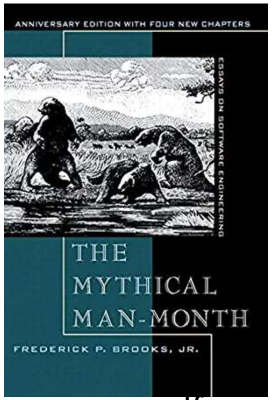
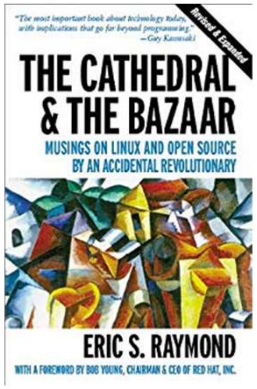


- the environment that works – now virtual
    - Slacks, Zooms, Githubs, …


ANNIVERSARY EDITION WITH FOUR NEW CHAPTERS
ESSAYS ON SOFTWARE ENGINEERING
THE MYTHICAL MAN-MONTH
FREDERICK P. BROOKS, JR.

- now self organizing chief programmer teams

- sharing economy before there was a sharing economy


"The most important book about technology today, with implications that go far beyond programming." —Guy Kawasaki
Revised & Expanded
THE CATHEDRAL & THE BAZAAR
MUSINGS ON LINUX AND OPEN SOURCE BY AN ACCIDENTAL REVOLUTIONARY
ERIC S. RAYMOND
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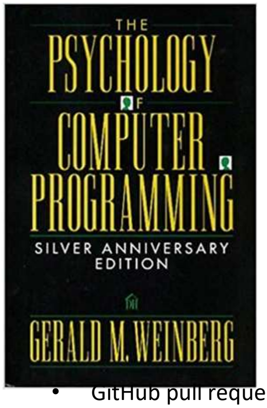
THE PSYCHOLOGY OF COMPUTER PROGRAMMING
SILVER ANNIVERSARY EDITION
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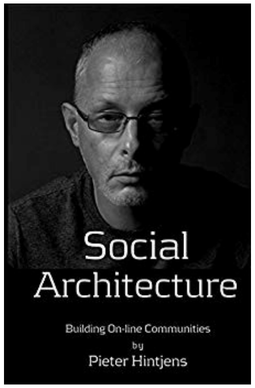
- GitHub pull requests
    - Embedding the code inspection/walkthrough



- how to architect the community

# The FIX Standard Itself

Case Study #1

# QuickFIX

- Developed by Oren Miller and Jim Downs and ThoughtWorks™ in 2001-2002
  - One of the first major Financial Markets open source projects
- QuickFIX/J developed in the mid-2000's by Steve Bates from SmartTrade
  - Now maintained largely by Cristoph John at MACD Associates
- Connamara Systems
  - QuickFIX/N, QuickFIX/Go
- Oren Miller
  - QuickFIX/C++, QuickFIX/Python

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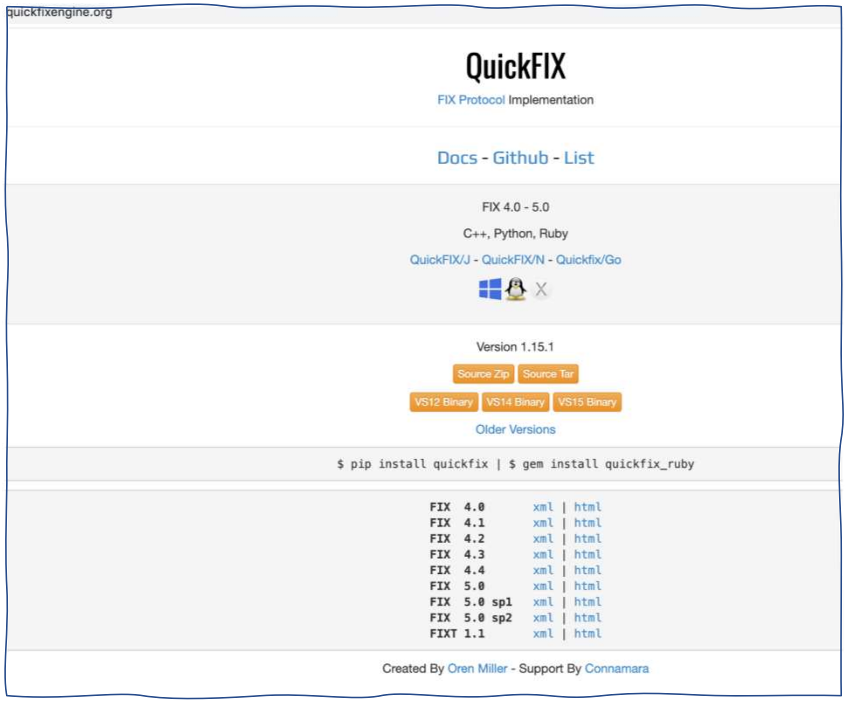


quickfixengine.org

# QuickFIX

FIX Protocol Implementation

Docs - Github - List

FIX 4.0 - 5.0

C++, Python, Ruby

QuickFIX/J - QuickFIX/N - Quickfix/Go

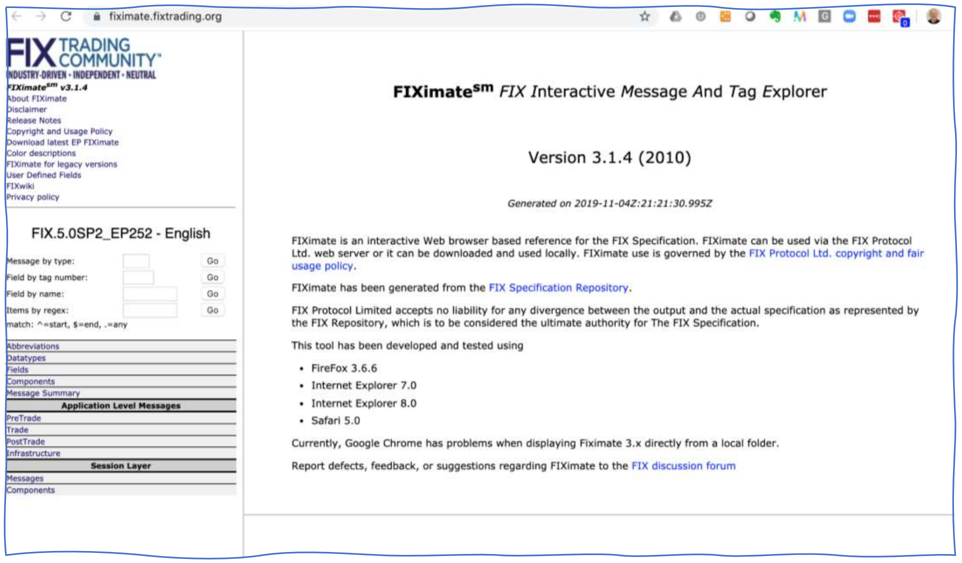
Version 1.15.1

Older Versions

```
$ pip install quickfix | $ gem install quickfix_ruby
```

|  |  |
|---|---|
| FIX 4.0 | xml \| html |
| FIX 4.1 | xml \| html |
| FIX 4.2 | xml \| html |
| FIX 4.3 | xml \| html |
| FIX 4.4 | xml \| html |
| FIX 5.0 | xml \| html |
| FIX 5.0 sp1 | xml \| html |
| FIX 5.0 sp2 | xml \| html |
| FIXT 1.1 | xml \| html |

Created By Oren Miller - Support By Connamara



fiximate.fixtrading.org

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*FIXimate*$^{sm}$ *v3.1.4*

About FIXimate
Disclaimer
Release Notes
Copyright and Usage Policy
Download latest EP FIXimate
Color descriptions
FIXimate for legacy versions
User Defined Fields
FIXwiki
Privacy policy

FIX.5.0SP2_EP252 - English

Message by type: Go
Field by tag number: Go
Field by name: Go
Items by regex: Go
match: ^=start, $=end, .=any

Abbreviations
Datatypes
Fields
Components
Message Summary

**Application Level Messages**

PreTrade
Trade
PostTrade
Infrastructure

**Session Layer**

Messages
Components

**FIXimate**$^{sm}$ *FIX Interactive Message And Tag Explorer*

Version 3.1.4 (2010)

*Generated on 2019-11-04Z:21:21:30.995Z*

FIXimate is an interactive Web browser based reference for the FIX Specification. FIXimate can be used via the FIX Protocol Ltd. web server or it can be downloaded and used locally. FIXimate use is governed by the FIX Protocol Ltd. copyright and fair usage policy.

FIXimate has been generated from the FIX Specification Repository.

FIX Protocol Limited accepts no liability for any divergence between the output and the actual specification as represented by the FIX Repository, which is to be considered the ultimate authority for The FIX Specification.

This tool has been developed and tested using

- FireFox 3.6.6
- Internet Explorer 7.0
- Internet Explorer 8.0
- Safari 5.0

Currently, Google Chrome has problems when displaying Fiximate 3.x directly from a local folder.

Report defects, feedback, or suggestions regarding FIXimate to the FIX discussion forum

# FIX Orchestra

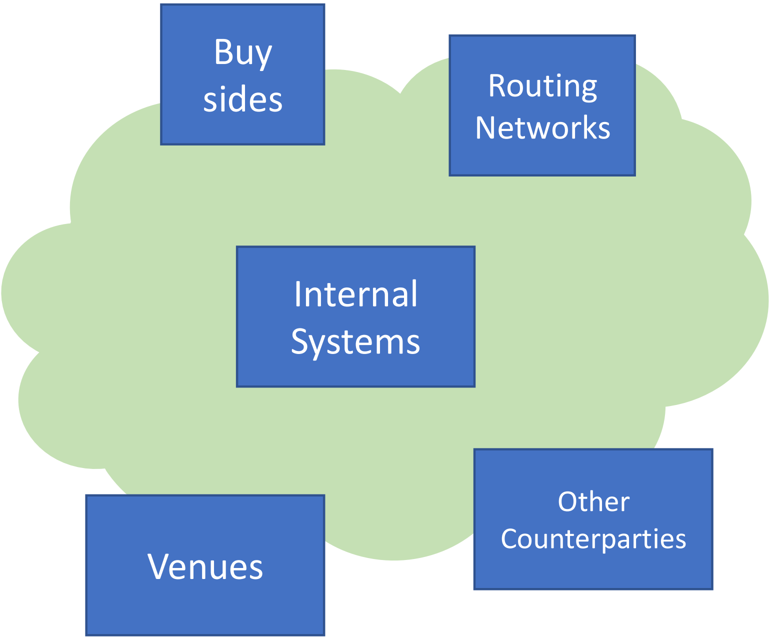
Case Study #1

# What problems are we trying to solve?

- FIX protocol was loosely specified from the start. Plenty of room for interpretation.
- Specifications are usually documented in *humanly readable documents* that are exchanged between counterparties. Humans must interpret the specs and turn them into executables and configurations.
  - Conditionally required fields are explained in text which must be interpreted and converted to code.
- FIX standards tell the universe of possible values.
  - Which values of OrdType and TimeInForce are accepted by my counterparty?
- Workflow is often not well documented.
  - Under what conditions do I get a Session Level Reject, a Business Message Reject, or an Execution Report with ExecType=Rejected?
  - The same message type may have different contents for different scenarios, e.g. Execution Report for order accepted versus an execution.
- **In short, the information we have is sparse and not directly actionable.**

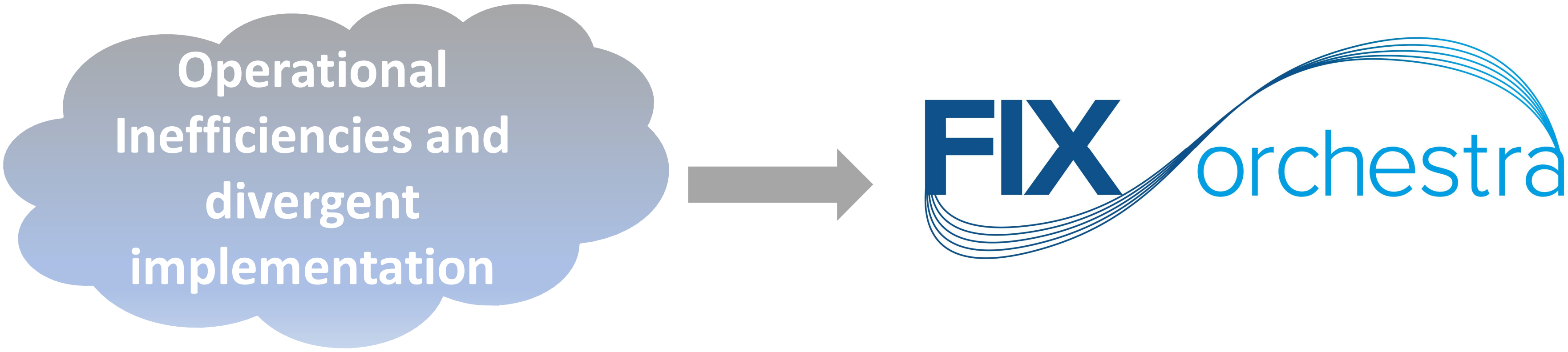
# Where are the pain points?

- Sell Side
  - Multiple flavors of FIX to support from the buy-side
    - Need to normalize
    - Need to certify
    - Need to provision
  - Multiple internal messaging applications
    - Some FIX
    - Some middleware
    - Some bespoke
  - Multiple venue gateways
    - Need to normalize
    - Need to certify
    - Need to provision



- Orchestra is a machine readable specification designed to address these issues and others, such as other messaging protocols, algorithmic trading parameters, and FIXatdl distribution

# *Plug and Play* comes to FIX



Operational Inefficiencies and divergent implementation

- Onboarding takes too long
- Certification of counterparty inadequate
- Labor intensive normalization efforts
- Inadequate testing

- Machine readable rules of engagement
- More precise and reduces work in interpretation of specs
- Conducive to automation: code, test case, and configuration generation

# Orchestra Assumptions…

- Large scale investment in FIX infrastructure not likely
- Any automation must be tactical and incremental
- Any automation / process improvement must be applicable to non-FIX protocols
- Firms are not providing resources to address operational inefficiencies
- **MUST** solve the key FIX challenges to be of value
- FIXatdl deployment

# What is FIX Orchestra and what does it do?

- **FIX Orchestra is a standard for exchanging machine-readable rules of engagement.**
- FIX remains the protocol on the wire.
- No changes required to your existing FIX engine (but you may wish to enhance it to read an Orchestra file).
- *FIX Orchestra is metadata about a specific implementation of FIX.*
- Orchestra is not a product, although FIX Trading Community is kickstarting open-source demonstrations.
- Vendors and firms are free to develop proprietary implementations, so long as they are conformant to the standard.

# What is FIX Orchestra and what does it do?

## Orchestra content, all machine readable

- Message structure by each scenario. Implemented as an extension of FIX Repository.
- Accepted values of enumerations by message scenario
- Workflow: when I send this message type under this condition, what can I expect back?
- How external states affect messages, e.g. market phases, order state, price
- Express a condition such as for a conditionally required field using an expression language

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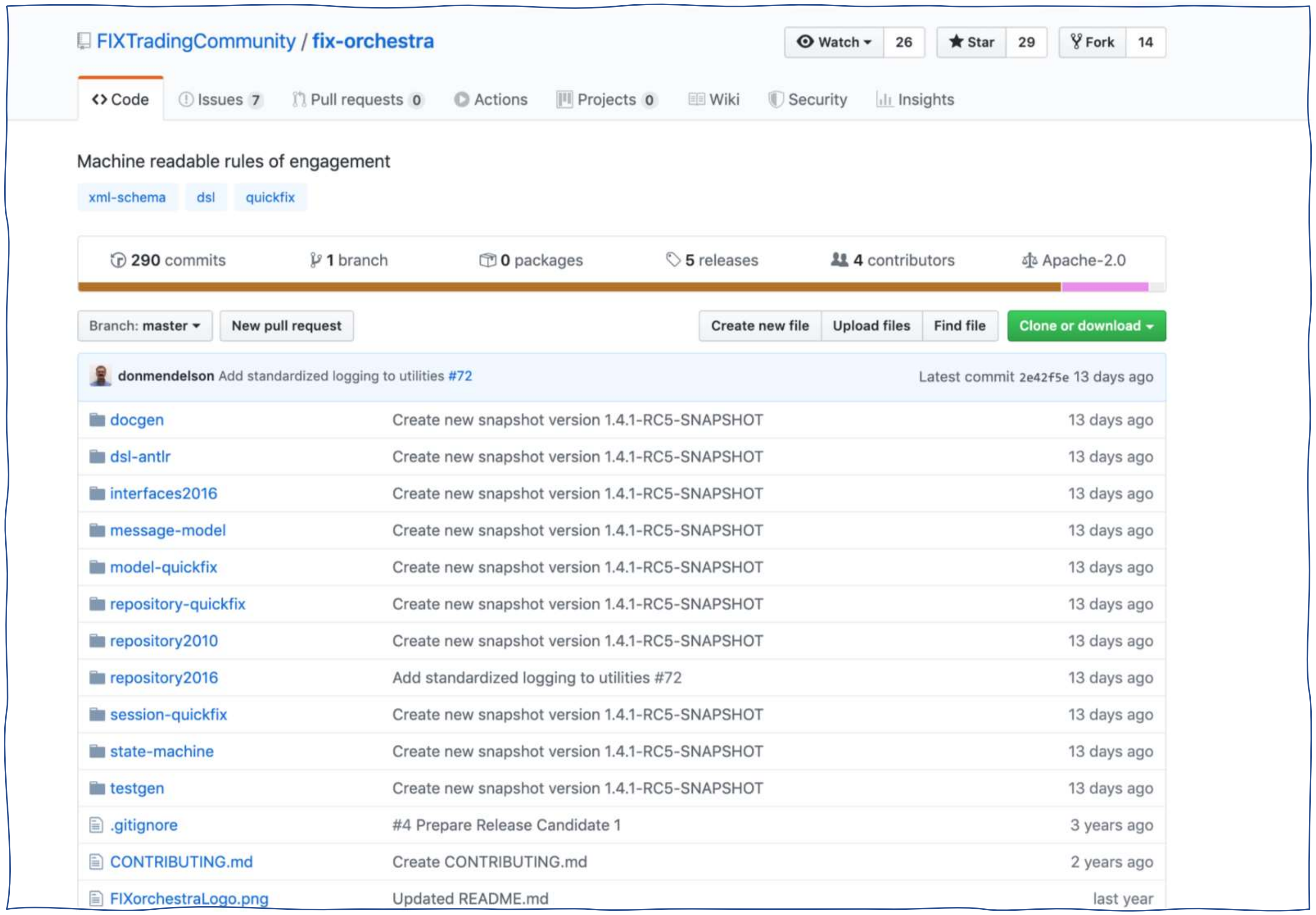

Machine readable rules of engagement

290 commits · 1 branch · 0 packages · 5 releases · 4 contributors · Apache-2.0

donmendelson Add standardized logging to utilities #72 — Latest commit 2e42f5e 13 days ago

| | | |
|---|---|---|
| docgen | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| dsl-antlr | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| interfaces2016 | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| message-model | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| model-quickfix | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| repository-quickfix | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| repository2010 | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| repository2016 | Add standardized logging to utilities #72 | 13 days ago |
| session-quickfix | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| state-machine | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| testgen | Create new snapshot version 1.4.1-RC5-SNAPSHOT | 13 days ago |
| .gitignore | #4 Prepare Release Candidate 1 | 3 years ago |
| CONTRIBUTING.md | Create CONTRIBUTING.md | 2 years ago |
| FIXorchestraLogo.png | Updated README.md | last year |

# FIX Latest

Case Study #2

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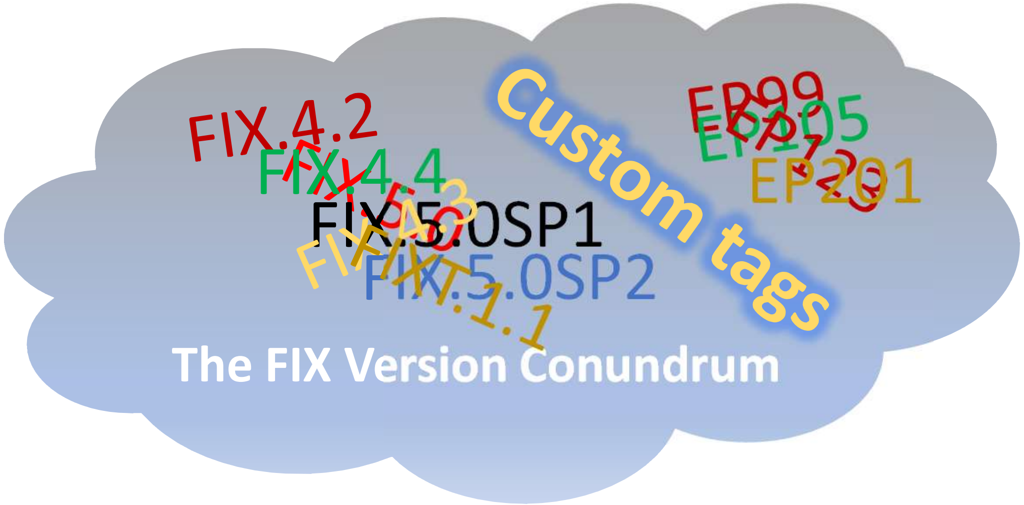
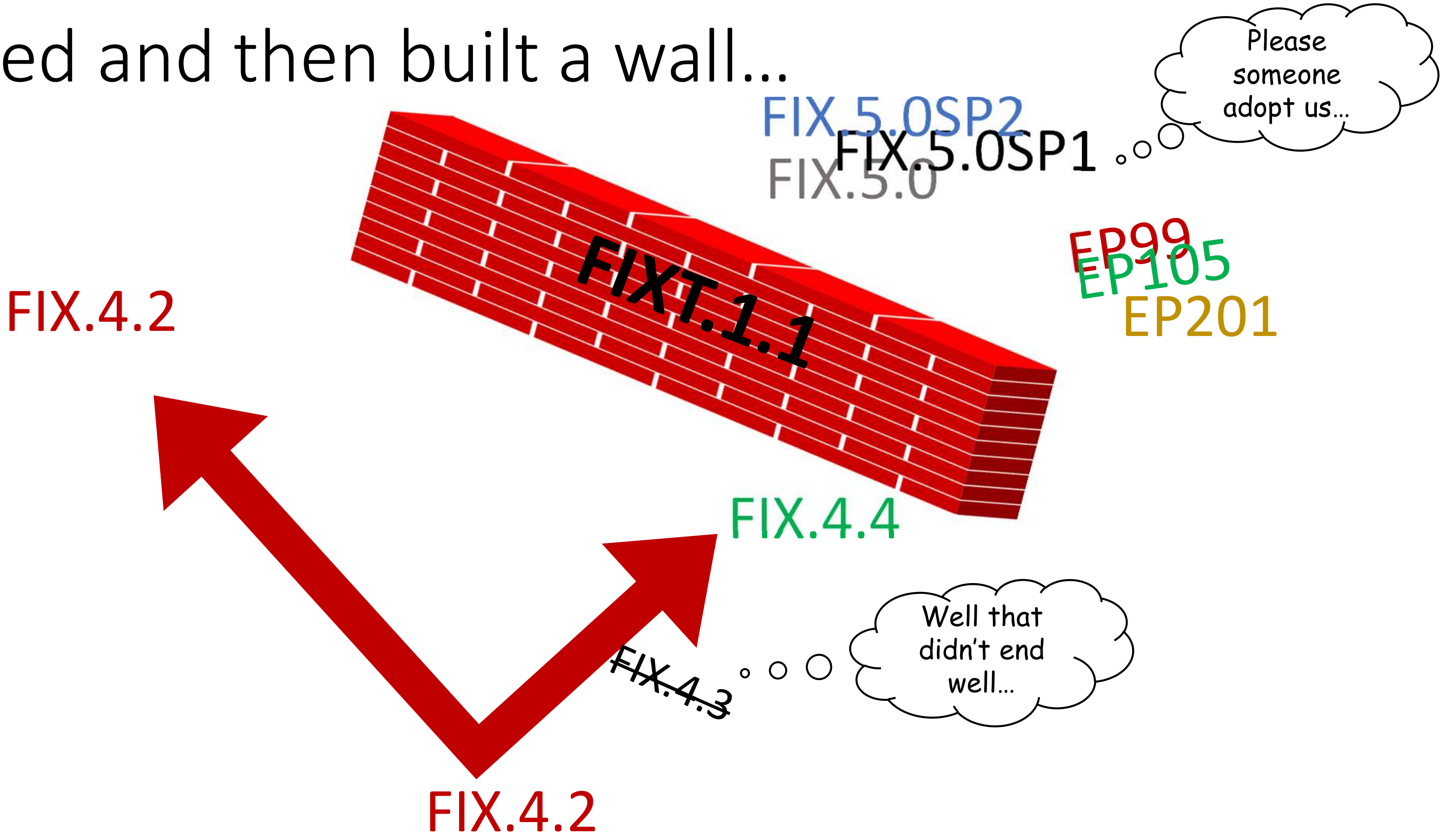
# FIX Latest - a simplification



- FIX supports custom fields and lacks any enforcement or compliance
  - Leading to considerable variance in implementations
- The changes made to FIX.4.3 broke backward compatibility
  - Thus guaranteeing a fork/fragmentation of adoption of the protocol
- The introduction of FIXT.1.1 as the session layer for FIX.5.0 required significant modification for negligible return
  - Effectively blocking access to new business functionality

# We forked and then built a wall…



FIX.5.0SP2

FIX.5.0SP1

FIX.5.0

Please someone adopt us…

EP99

EP105

EP201

FIXT.1.1

FIX.4.2

FIX.4.4

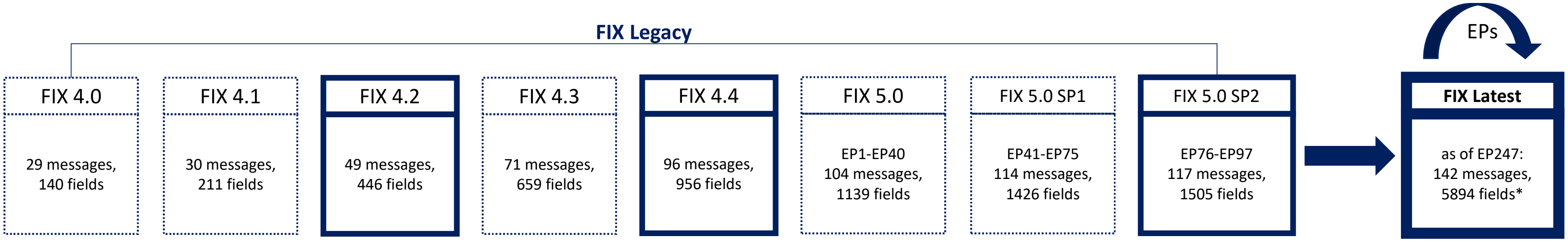
~~FIX.4.3~~

Well that didn't end well…

FIX.4.2

# FIX Versioning Concept

- A FIX version is a well-defined and static set of messages, components, fields and valid values for the application layer.
- FIX implementations often go beyond the static set and use elements from higher versions, e.g. to satisfy regulatory requirements or due to bilateral agreement to benefit from extensions provided after the chosen FIX version.
- FIX versions are now part of **FIX Legacy** and split into supported (FIX 4.2, 4.4, 5.0 SP2) and unsupported versions.
- The highest "version" of FIX is called **FIX Latest** and is growing with every official **Extension Pack**. EPs will not break backward compatibility but may deprecate elements that have been replaced to overcome limitations.
- The interface specification between parties, aka **Rules of Engagement**, defines the subset of messages, components, fields and valid values for the application layer that are supported by the given interface.



**FIX Legacy**

FIX 4.0
29 messages, 140 fields

FIX 4.1
30 messages, 211 fields

FIX 4.2
49 messages, 446 fields

FIX 4.3
71 messages, 659 fields

FIX 4.4
96 messages, 956 fields

FIX 5.0
EP1-EP40
104 messages, 1139 fields

FIX 5.0 SP1
EP41-EP75
114 messages, 1426 fields

FIX 5.0 SP2
EP76-EP97
117 messages, 1505 fields

EPs

**FIX Latest**
as of EP247:
142 messages, 5894 fields*

* Includes tags 40000 – 43096 for OTC derivatives instruments

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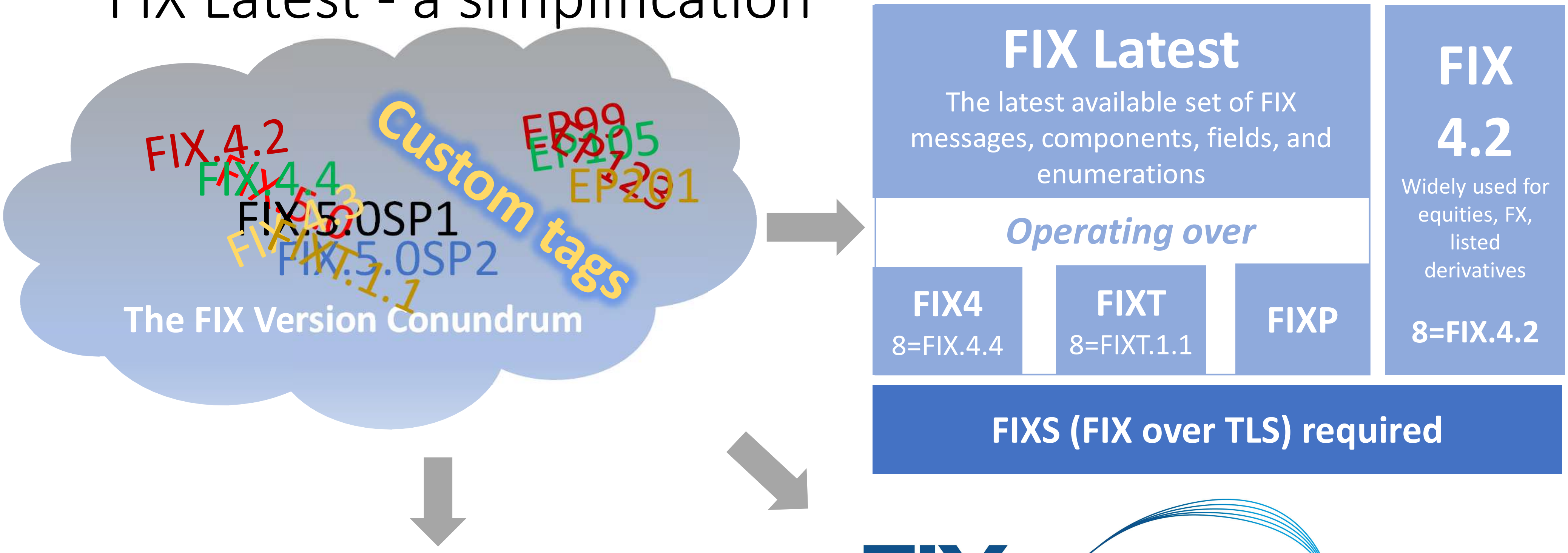
# FIX Latest - a simplification



**FIX Latest**

The latest available set of FIX messages, components, fields, and enumerations

*Operating over*

**FIX4**
8=FIX.4.4

**FIXT**
8=FIXT.1.1

**FIXP**

**FIX 4.2**

Widely used for equities, FX, listed derivatives

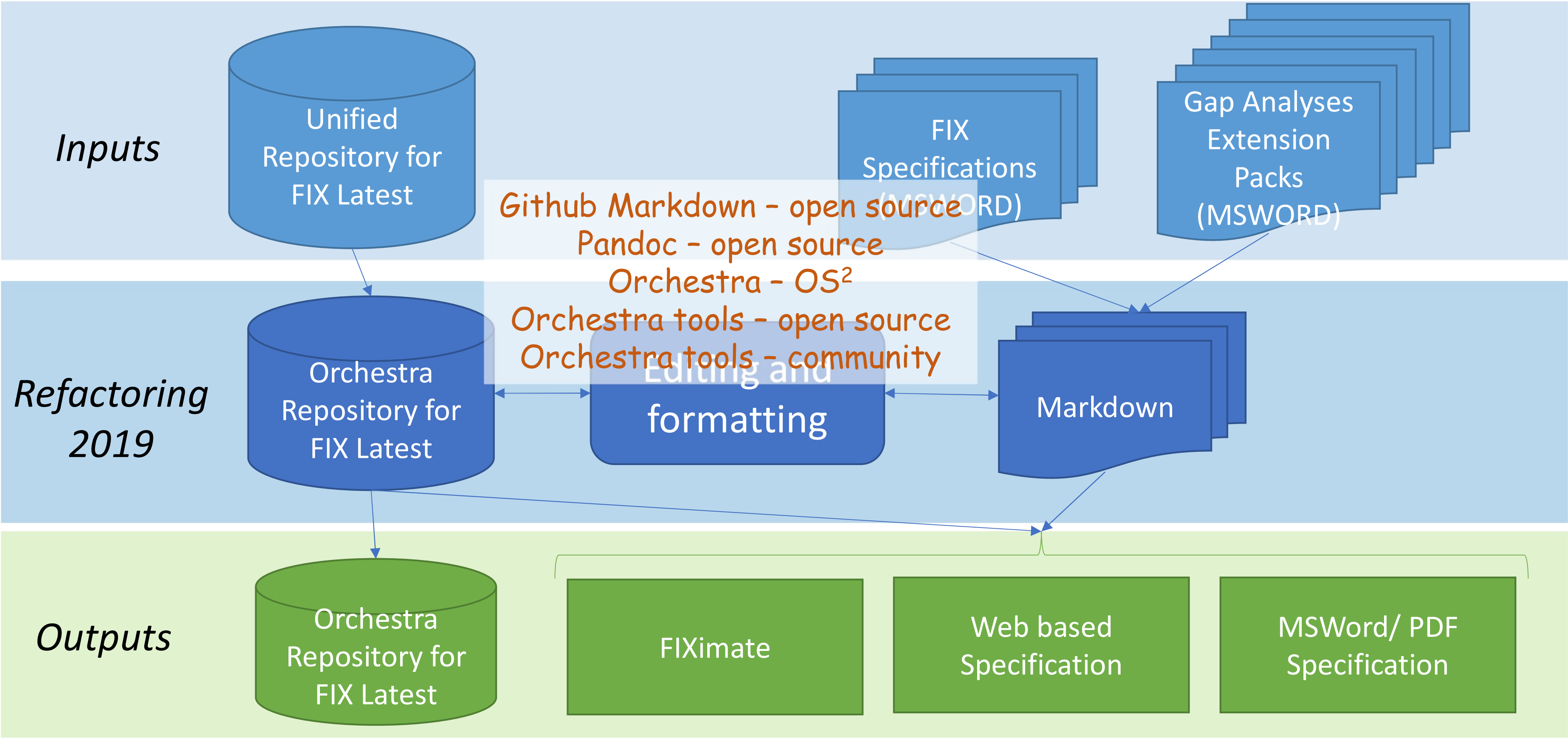
**8=FIX.4.2**

**FIXS (FIX over TLS) required**

The FIX Extension Pack Process can provide official fields, enumerations, messages, components rapidly for immediate use with ***FIX LATEST***

FIX orchestra

# Refactoring the FIX Specification


Inputs
Unified Repository for FIX Latest
FIX Specifications (MSWORD)
Gap Analyses Extension Packs (MSWORD)
Refactoring 2019
Orchestra Repository for FIX Latest
Editing and formatting
Markdown
Outputs
Orchestra Repository for FIX Latest
FIXimate
Web based Specification
MSWord/ PDF Specification

Github Markdown – open source
Pandoc – open source
Orchestra – $OS^2$
Orchestra tools – open source
Orchestra tools – community

OS$^2$

# Conga

Case Study #3

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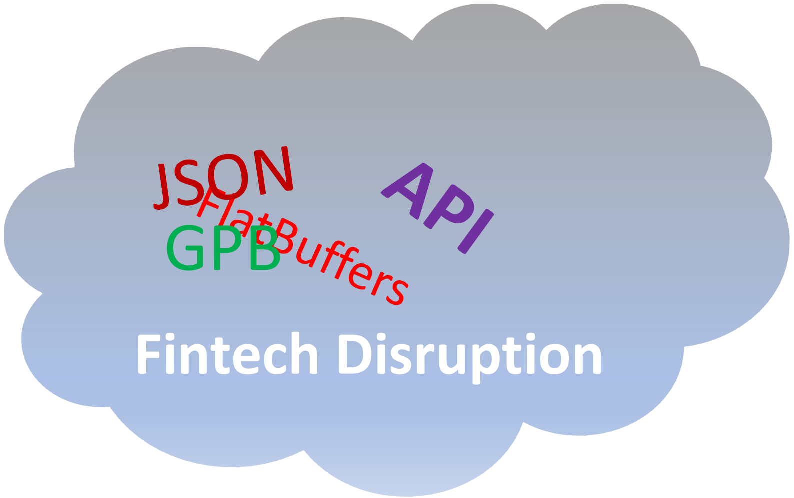
FIX is the Language of Trading.

# FIX Semantics over a modern web stack

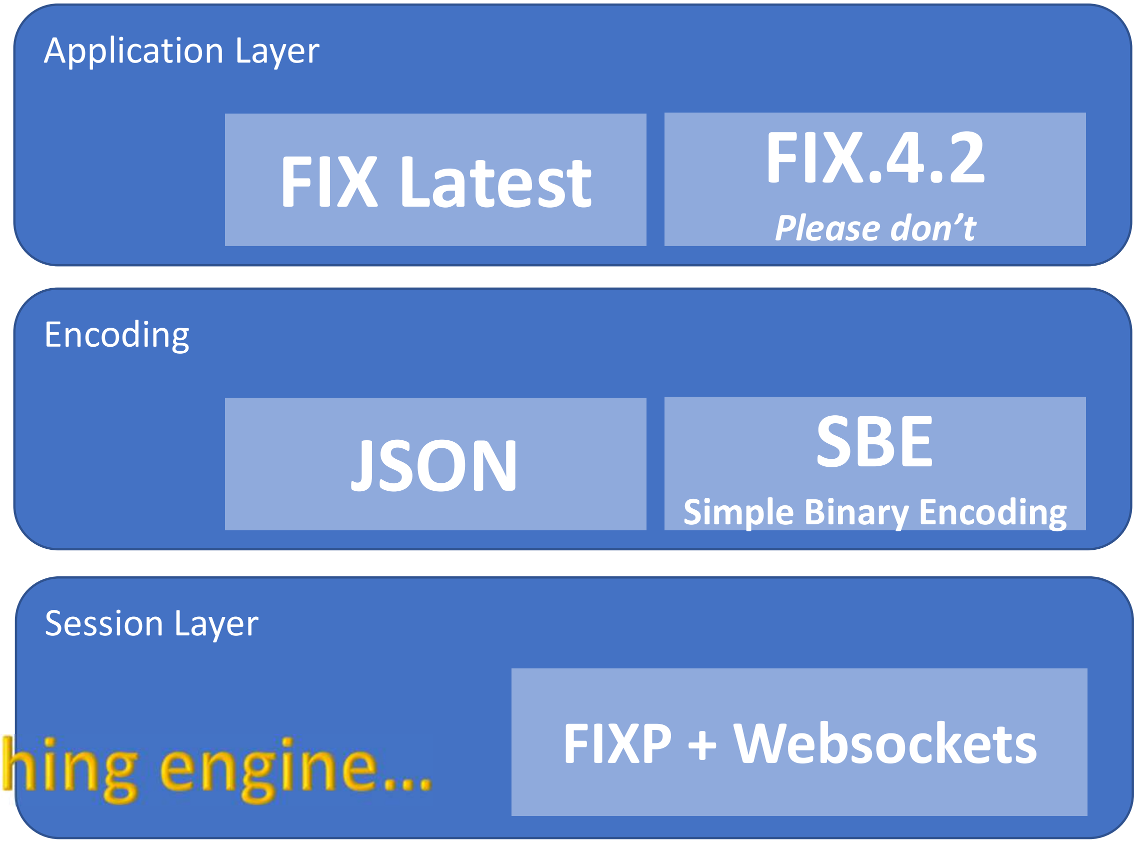


CONGA Proof of Concept

FIX Trading Community Github

Apache 2.0

https://github.com/FIXTradingCommunity/conga



Application Layer

FIX Latest

FIX.4.2 *Please don't*

Encoding

JSON

SBE Simple Binary Encoding

Session Layer

FIXP + Websockets

And we throw in a matching engine...

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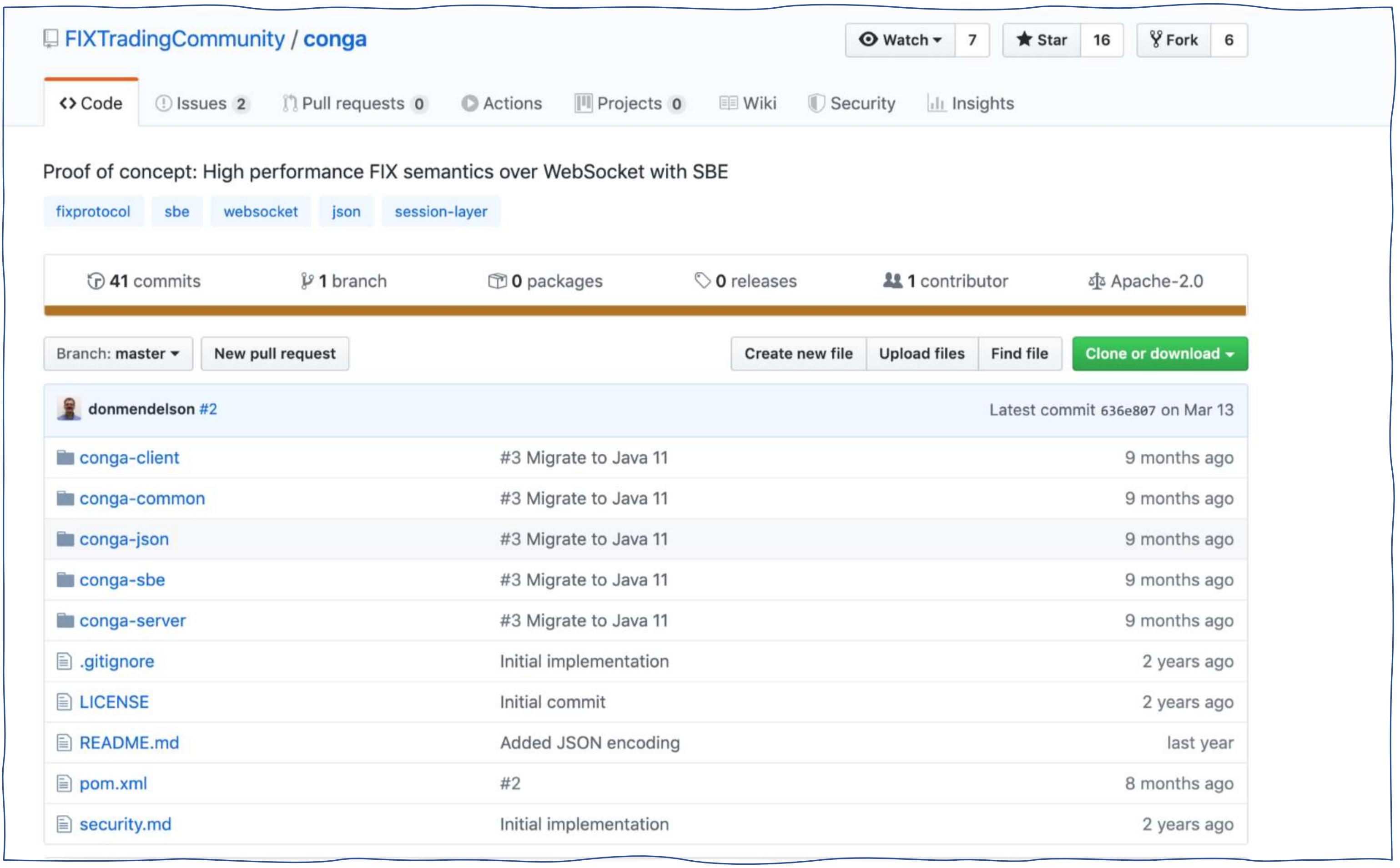
OS$^2$



FIXTradingCommunity / conga

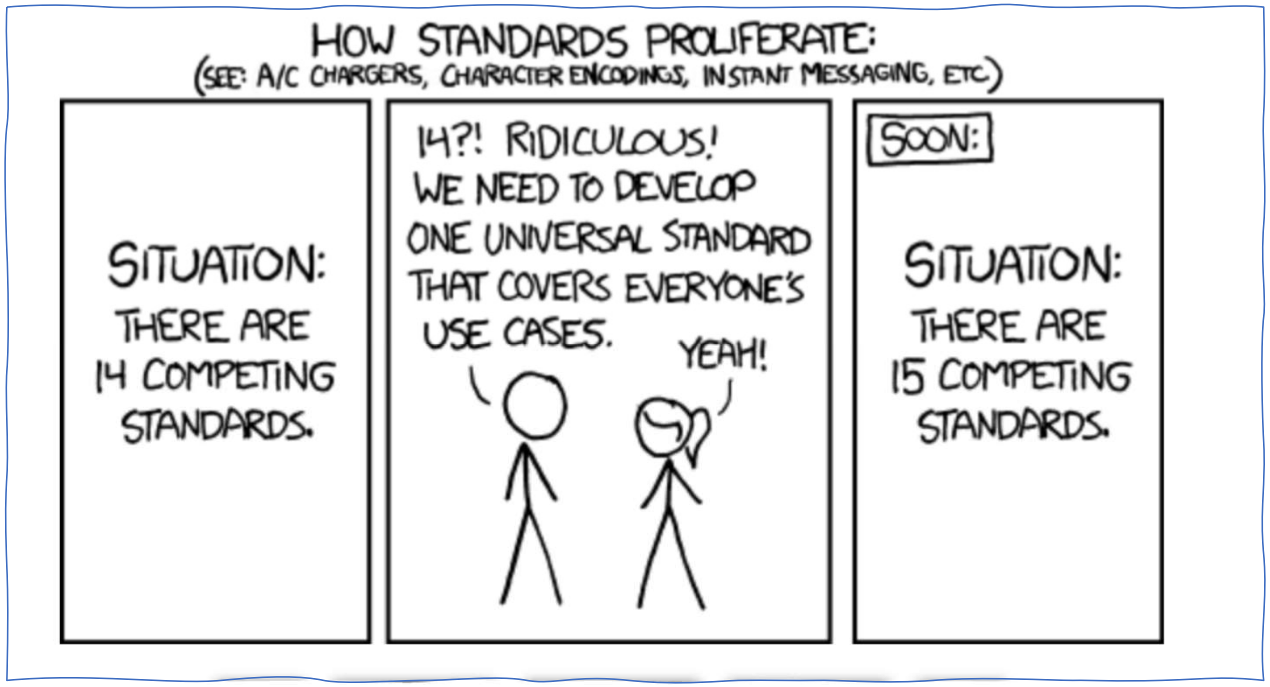
Proof of concept: High performance FIX semantics over WebSocket with SBE

donmendelson #2 — Latest commit 636e807 on Mar 13

| | | |
|---|---|---|
| conga-client | #3 Migrate to Java 11 | 9 months ago |
| conga-common | #3 Migrate to Java 11 | 9 months ago |
| conga-json | #3 Migrate to Java 11 | 9 months ago |
| conga-sbe | #3 Migrate to Java 11 | 9 months ago |
| conga-server | #3 Migrate to Java 11 | 9 months ago |
| .gitignore | Initial implementation | 2 years ago |
| LICENSE | Initial commit | 2 years ago |
| README.md | Added JSON encoding | last year |
| pom.xml | #2 | 8 months ago |
| security.md | Initial implementation | 2 years ago |

# The Data Conundrum

It’s about the data stupid…


HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)
SITUATION: THERE ARE 14 COMPETING STANDARDS.
14?! RIDICULOUS! WE NEED TO DEVELOP ONE UNIVERSAL STANDARD THAT COVERS EVERYONE'S USE CASES.
YEAH!
SOON:
SITUATION: THERE ARE 15 COMPETING STANDARDS.

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FIBO
Financial Industry Business Ontology

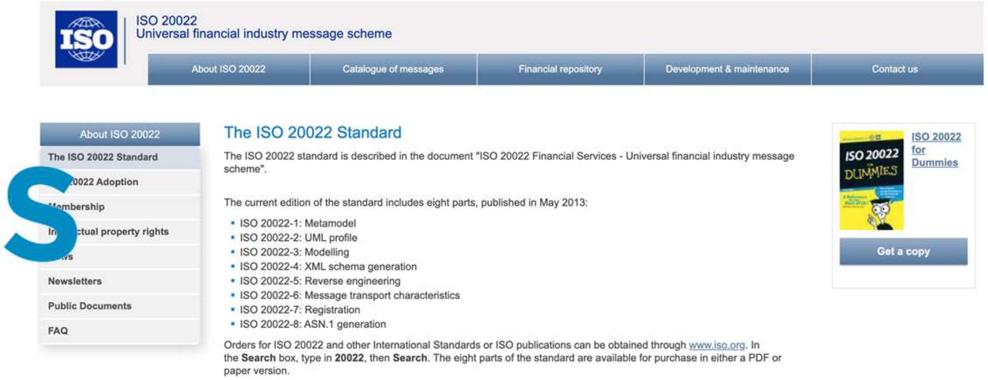
EDMCouncil

FINOS

FpML

ISDA® Safe, Efficient Markets

ISDA CDM



ISO 20022
Universal financial industry message scheme

## The ISO 20022 Standard

The ISO 20022 standard is described in the document "ISO 20022 Financial Services - Universal financial industry message scheme".

The current edition of the standard includes eight parts, published in May 2013:

- ISO 20022-1: Metamodel
- ISO 20022-2: UML profile
- ISO 20022-3: Modelling
- ISO 20022-4: XML schema generation
- ISO 20022-5: Reverse engineering
- ISO 20022-6: Message transport characteristics
- ISO 20022-7: Registration
- ISO 20022-8: ASN.1 generation

Orders for ISO 20022 and other International Standards or ISO publications can be obtained through www.iso.org. In the **Search** box, type in **20022**, then **Search**. The eight parts of the standard are available for purchase in either a PDF or paper version.

ISO 20022 for Dummies

$

Financial Objects

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OpenFIGI

ACTUS
ALGORITHMIC CONTRACT TYPES UNIFIED STANDARDS

# Project ACTUS

- Recent financial crises laid bare serious shortcomings in risk management and financial regulation. In retrospect, the lack of timely granular data reported in a data standard capable of supporting financial analysis contributed much to the crises. The ACTUS project aims to remedy this weakness by creating a global standard for the consistent representation of financial instruments.
- The centrality of expected cash flows for financial analysis is obvious and undisputed. Less obvious is the role of the financial contracts. Financial contracts are mutual agreements between counterparties to exchange cash flows. The agreements are written by lawyers in different languages, legal terminology, and jurisdictions. This leaves us with a plethora of terms and different contracts.
- However, if one abstracts from the legal terms and focuses on the cash flow obligations, the diversity of financial contracts or agreements shrinks drastically. The vast majority of the relevant financial contracts are built on a manageable number of underlying mechanisms. Financial contracts follow a limited number of patterns.
- The goal of ACTUS is to break down the diversity in financial instruments into a manageable number of cash flow patterns – so called Contract Types (CT).

# Financial Instrument Business Ontology

- Work done in conjunction with the Object Management Group Financial Domain Task Force (OMG/FDTF)
- he Financial Industry Business Ontology (FIBO) is a business conceptual model developed by our members of how all financial instruments, business entities and processes work in the financial industry.
- Precise meaning translates into a common language between systems and sources, reduces the cost of doing business and promotes confidence in data among business users. FIBO is the standard for harmonization of data across repositories. It is a mechanism for validating data quality. It is the building block for business process automation and the pathway for flexible risk analysis.
- Upheaval over the past two years – new effort focused on open source and practitioner working groups.
- EDM Council / OMG-FTDF

# ISDA Common Data Model (CDM)

- The 1st version of the CDM was released in 2018 and it has been made open source earlier this year. What characterizes the CDM is that it provides an executable implementation that combines data representation and execution logic. It is also meant to be compatible with other data standards through embedded mapping logic.
- I would characterize FpML by the fact that its an XML-based messaging protocol. It should be noted that its scope has expanded beyond OTC derivatives. Its latest version (5.11) includes support for secured funding products.
- It might be valuable to include a column to characterize the usage of those respective data standards in some way, as this is a major differentiator.

ISO 20022
Universal financial industry message scheme

# ISO 20022

- Repository primarily intended to support ISO 20022 messaging standard that includes a business model and the FIBIM model.
- Increasingly required by regulators globally: Europe, China
- Consists of layered model: Business Model, Logical Model, and Messaging Model
- Eclipse Modeling Framework based

# FINOS Financial Objects

- New entrant focused on work previously done within member organization
- Objects aligned along business processes
- The Financial Objects Project goal is to help drive adoption of new and existing Financial Object Standards across the Financial Services Industry by bringing together the creators of Financial Objects with the users of Financial Objects.
- We will take a use case driven approach to the definition and creation of new Financial Object types and associated Projects to enable business workflows and connectivity using these financial objects.

# FIX Protocol and FIX Orchestra Repository

- Repository for FIX Messages
- Focused on messaging not a separate business model
- Vital that FIX data items – the source of straight through processing from pre-trade through to settlement now be represented in any industry data model aimed at improving operational efficiency
- The key FO objects overlap 100% with FIX
- The FIX Trading Community recognizes the need for a data model for the industry
- The FIX Trading Community likely would prefer to partner than to pursue building such a data model
- FIX realizes the importance of ISO compatibility in terms of regulatory requirements globally

# Observation: Message about the Message

- Messaging is equivalent to railroads and the shipping containers
  - Still exist
  - Still play a role
- APIs are equivalent to tractor-trailer rigs and UPS/Fedex
- What is needed is a repository for data that contains the strong semantic information about each data item
- Based upon work going on in IIoT
  - Semantics model with views or aspects looking into the semantically rich data model

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# 2019 FIX Global Technical Committee Focus

**Operational Inefficiencies and divergent implementation**

**Refactoring the FIX Specification based upon FIX Latest**

**Fintech Disruption**

2020 Evangelizing and rising above the din

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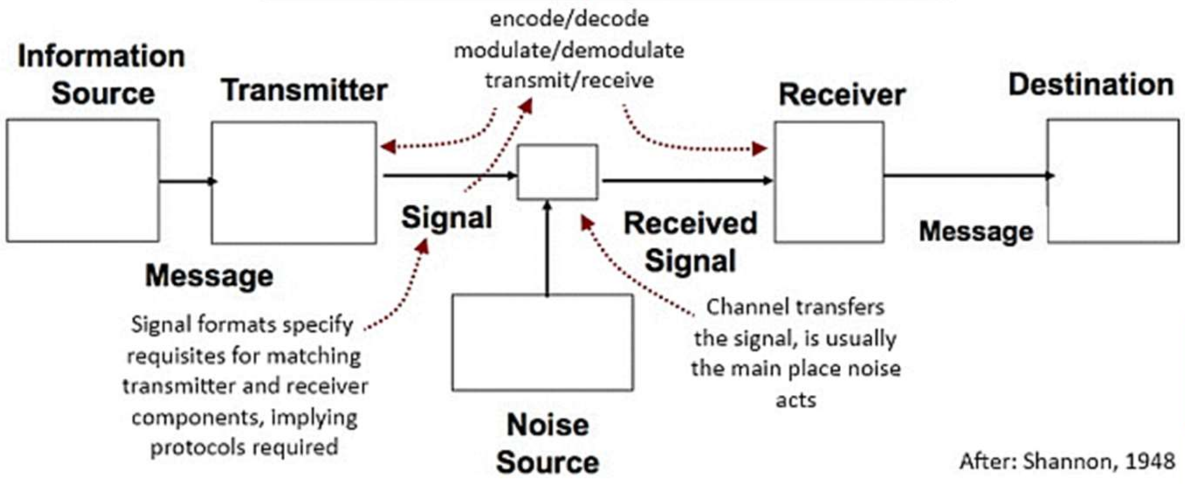
## Shannon-Weaver (telecommunications)


Information Source

Transmitter

encode/decode
modulate/demodulate
transmit/receive

Receiver

Destination

Signal

Received Signal

Message

Message

Signal formats specify requisites for matching transmitter and receiver components, implying protocols required

Channel transfers the signal, is usually the main place noise acts

Noise Source

After: Shannon, 1948

There is now so much information it is all noise

thebitplayer.com/#introduction

1 THE BIT PLAYER
CLAUDE SHANNON : PROPHET OF INFORMATION

*Table of Contents* Introduction Claude Shannon The Bit Players Screenings Mailing List More Information

*A film*

*by* *Mark A. Levinson*
*Director of the Award-Winning Film* PARTICLEFEVER

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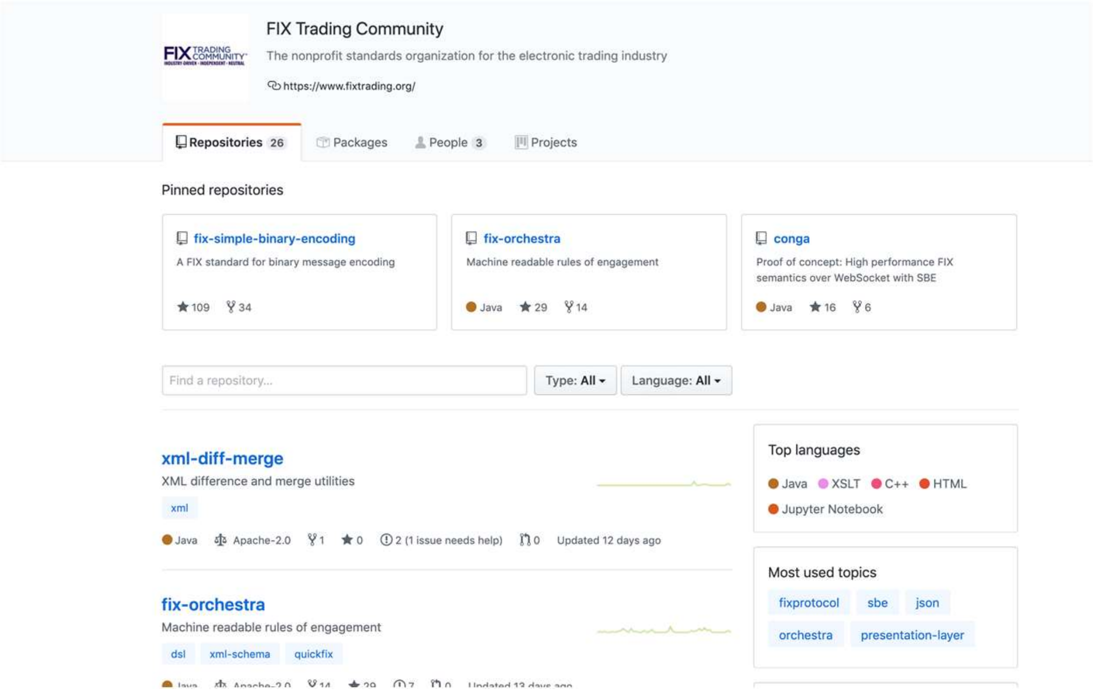
# FIX Trading Community and Open Source

https://github.com/FIXTradingCommunity



FIX Trading Community

The nonprofit standards organization for the electronic trading industry

https://www.fixtrading.org/

Pinned repositories

**fix-simple-binary-encoding**
A FIX standard for binary message encoding
★ 109 34

**fix-orchestra**
Machine readable rules of engagement
● Java ★ 29 14

**conga**
Proof of concept: High performance FIX semantics over WebSocket with SBE
● Java ★ 16 6

**xml-diff-merge**
XML difference and merge utilities
xml
● Java Apache-2.0 1 ★ 0 2 (1 issue needs help) 0 Updated 12 days ago

**fix-orchestra**
Machine readable rules of engagement
dsl xml-schema quickfix
● Java Apache-2.0 14 ★ 29 7 0 Updated 13 days ago

Top languages
● Java ● XSLT ● C++ ● HTML
● Jupyter Notebook

Most used topics
fixprotocol sbe json
orchestra presentation-layer

OS$^2$

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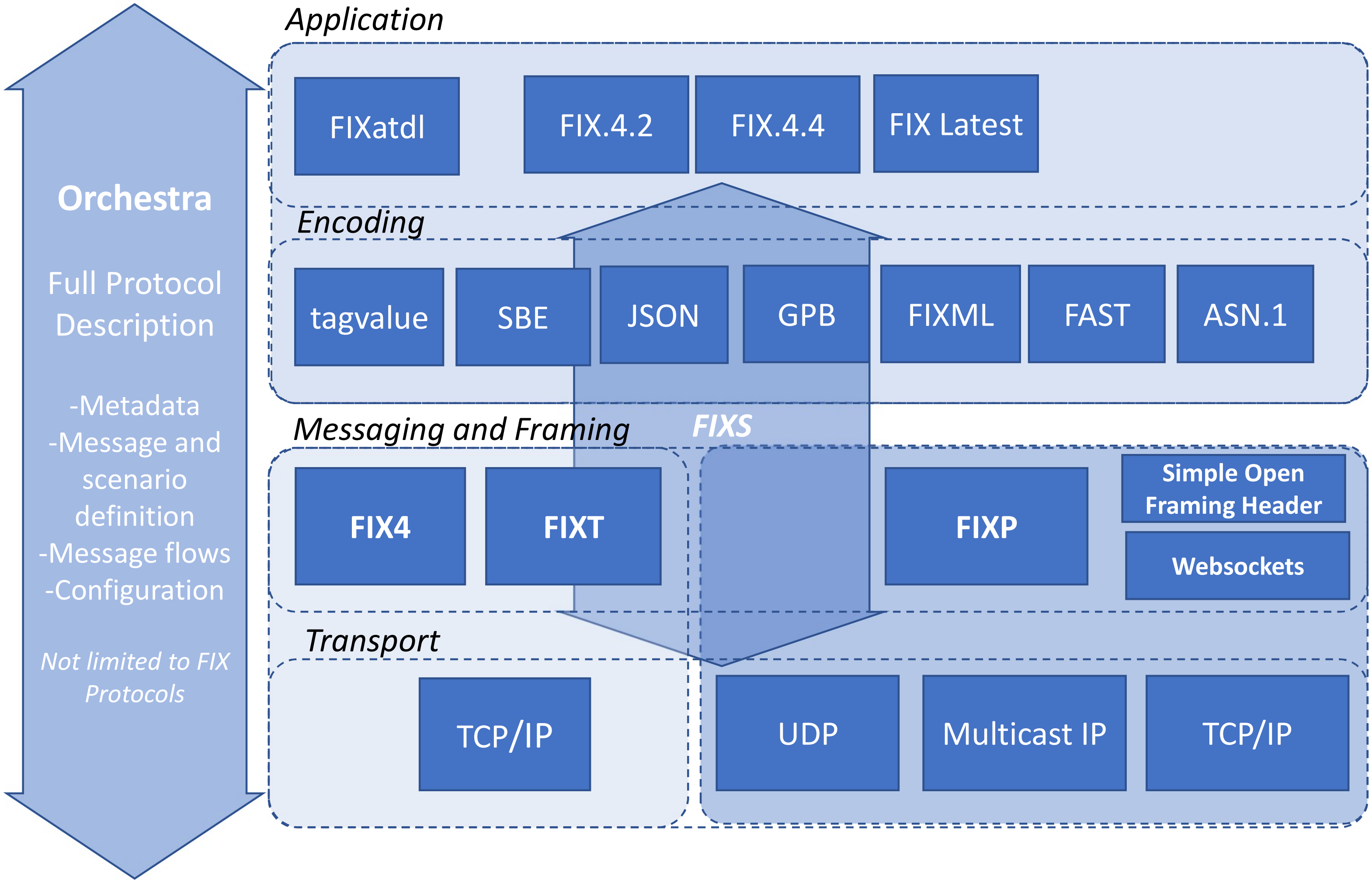
# FIX Technical Standard Stack as of August 2019



**Orchestra**

Full Protocol Description

-Metadata
-Message and scenario definition
-Message flows
-Configuration

*Not limited to FIX Protocols*

*Application*

FIXatdl
FIX.4.2
FIX.4.4
FIX Latest

*Encoding*

tagvalue
SBE
JSON
GPB
FIXML
FAST
ASN.1

*Messaging and Framing*

***FIXS***

**FIX4**
**FIXT**
**FIXP**
**Simple Open Framing Header**
**Websockets**

*Transport*

TCP/IP
UDP
Multicast IP
TCP/IP

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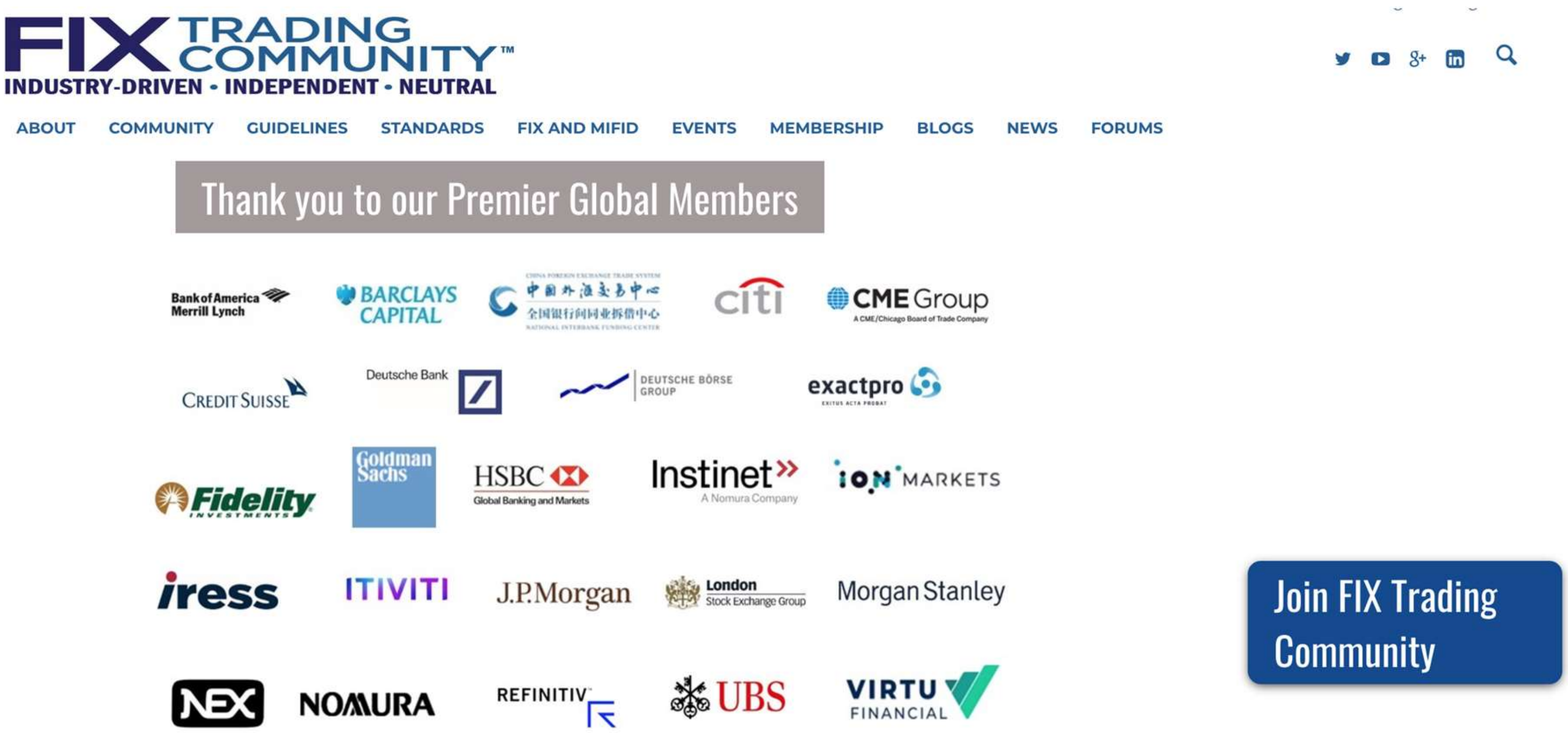

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