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Reference data distribution in financial services

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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This document was prepared by Technical Committee ISO/TC 68, *Financial services*, Subcommittee SC 9, *Information exchange for financial services*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

0.1 Opening comments

With the increasing correlation between financial products, a lot of reference data (trading product, trading institution, trader information) are shared and reused in financial services. There is an urgent and significant worldwide demand for guidance and standardization of reference data distribution in financial services. Moreover, many industries expect efficient data distribution to ensure consistency, integrity, relevance and accuracy.

This document covers distribution modes (distributed and centralized), task scheduling, privacy protection, security and other issues. Data consistency and security are fundamental concerns for distributors, receivers, the ordered execution of the distribution tasks and independent distribution tasks of different receiver systems. Efficient distribution can achieve the goal of real-time synchronization of reference data, ensure that all organizations receive the most accurate data information in time and prevent system operation problems caused by information asymmetry.

This document's potential applications are independent of specific business scenarios and irrelevant to data type and data format specifications.

This document is intended to provide:

— reference information for distributors;

— new products and services for developers;

— benefits for receivers using reference data.

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The purpose of this document is to simplify the data processing procedure, as well as improve the data distribution reliability and data sharing capabilities. Specifically, it will include two distribution modes: centralized distribution mode and distributed distribution mode. The former is traditional and the latter is emerging. Therefore, this document will be conducive to promoting new solutions for reference data distribution scenarios, such as distributed ledger technology. These benefits would be realized between certain service participants and within them.

0.2 How to approach this document

This document aims to provide a comprehensive insight into the development of reference data interfaces (RDIs) to realize efficient reference data distribution in financial services. In this sense, some aspects of the document are more mature than others. For example, the text is prescriptive where there is room to be so; where areas are less mature, commentary on good practice is provided and the considerations set out.

Broadly speaking, the document adopts the following logic:

— terms and definitions: all terms in the document;

— design principles: the principles and considerations for the design of the RDI;

— related technology: considerations and commentaries on different technologies;

— business model: the transmission process of public reference data and financial data standards;

— logical model: analysis of the logical structure of business data;

— physical model: overview and commentaries on the broker-based model and the non-broker-based model;

— interactions: considerations of the interactions between publishers and subscribers;

— QoS control: control of the network resource application in the transmission of reference data.

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Reference data distribution in financial services

1 Scope

This document discusses the modes, related mainstream technologies, logical models, physical implementation models, data management (data storage and data security) and service quality control used in the reference data distribution in financial services.

This document applies to the reference data distribution and transmission processes in financial services.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
reference data
shareable and reusable basic information in financial service scenarios

Note 1 to entry: A large amount of shareable and reusable basic information exists in financial service scenarios, such as legal entity identification codes (LEI), bank identification codes (BIC), bond issuers, buyers and sellers.

3.2
distributed ledger
data store through a network of distributed nodes

Note 1 to entry: Distributed ledger is a way of recording data that does not need to be stored or confirmed by any centralized entity.

Note 2 to entry: Distributed ledger is the most critical blockchain technology used in the capital market, an asset database that can be shared among multiple sites, different geographic locations or networks composed of multiple institutions.

3.3
financial technology
technology innovation of traditional financial products and services

Note 1 to entry: Financial technology uses various technological means to innovate the products and services provided in the traditional financial industry to improve efficiency and reduce operating costs.

3.4
full-duplex communication protocol
network protocol based on TCP

Note 1 to entry: Full-duplex communication protocol realizes full-duplex communication between the client and the server, which allows the server to send information to the client actively.

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3.5
remote method invocation
Java interface class library

Note 1 to entry: Remote method invocation enables objects on the client-side virtual machine to call objects on the server-side Java virtual machine as if they were local objects.

3.6
FIX® protocol[1)]
Financial Information eXchange protocol
open electronic communications protocol designed to standardise and streamline electronic communications in the financial services industry, supporting multiple formats and types of communications between financial entities, including trade allocations, order submissions, order changes, executions reporting and advertisements

3.7
IMIX protocol
Inter-bank Market Information eXchange Protocol
financial industry standard based on the FIX protocol and widely used in the inter-bank market

3.8
RDI
reference data interface
set of well-defined methods, functions, protocols, routines or commands used for reference data

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4 Principles

4.1 General

This clause covers the design principles that are considered up front when developing an RDI in financial services.

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4.2 Compatibility

The RDI refers to some industry standards and is based on open architecture.

4.3 Data accuracy

Data accuracy is considered up front when developing the RDI to ensure that the data source can be monitored, the data can be transmitted in real time in batches and the data loss can be recovered.

4.4 High availability

High availability is considered to ensure no error accumulation and low data distribution latency to enable real-time communication.

4.5 Extensibility

Where possible, the RDI ecosystem is designed to be as extensible as possible to adapt to future use cases or scenarios. For example, software keeps an upgrade interface and upgrade space. In addition, the software entities (e.g. modules, classes, functions) are open for extension but closed for modification based on the open-closed principle.

1) FIX® is the trademark of FIX Protocol Limited. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

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4.6 Security

The RDI ensures the security of user information and the information involved in the operation process. Furthermore, it repairs and handles various security vulnerabilities in a timely manner.

4.7 Maintainability

Maintainability includes code comprehensibility, testability, modifiability and system portability.

5 Related technology

5.1 Fintech

Financial technology (fintech) is a business model formed by the integration of finance and technology, specifically including digital payment, online lending, digital currency, equity crowdfunding and intelligent investment advisory. It mainly utilizes innovative technologies such as the internet, big data, cloud computing, blockchain and artificial intelligence to significantly affect the financial markets, financial institutions and the way financial services are provided.

5.2 WebSocket

The WebSocket protocol is a full-duplex communication protocol based on TCP. It implements full-duplex communication between the client and the server, allowing the server to send information to the client actively.

Most web applications implement long polling through frequent asynchronous JavaScript and XML (AJAX) requests, which is inefficient and wasteful of resources (because it requires constant connections, or the HTTP connection is always open). WebSocket abandons the traditional HTTP request/response mechanism and realizes a more flexible and accessible bilateral communication. The client browser first initiates an HTTP request to the server to establish a WebSocket connection. This request is different from the usual HTTP request as it contains some extra header information. One piece of additional header information called “Upgrade: WebSocket” indicates that this is an application for a protocol upgrade. The server side parses this additional header information and then generates a response message back to the client side. Finally, the connection is established and both parties transfer information freely through the channel until either the client or the server side actively closes the connection.

5.3 AJAX

Ajax (Asynchronous JavaScript and XML) is an integration of several technologies, including:

— dynamic display and interaction by DOM;

— data exchange and processing by XML and XSLT;

— asynchronous data reading by XML HTTP request;

— finally binding and processing data with JavaScript.

The principal of Ajax is an intermediate layer between the client and the server. Not all user requests are submitted to the server; the Ajax engine submits the request only when it is determined that new data needs to be read from the server. Through appropriate Ajax applications, some of the previous work of the server is transferred to the client. As a result, it can facilitate the processing on the client side and reduce the burden on the server and bandwidth.

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5.4 RMI

RMI (Remote Method Invocation) is a core Java API class library that allows programs running on a Java virtual machine to access the objects running on different virtual machines (even if the different virtual machines are running on different physical hosts). RMI passes parameters to remote methods and returns results from remote methods calls.

5.5 Blockchain

Blockchain refers to a database distributed across locations (a distributed database) that acts as a digital ledger to record and manage transactions. Copies of the ledger are held by multiple parties themselves, data are added through negotiation by all parties and there is no need to have a third-party agent for managing the ledger.

The blockchain has the following characteristics:

— Immutable records: theoretically, the data added to the ledger is immutable and secure, and it disappears with the disappearance of the ledger; its content is jointly determined by all participants.

— No intermediaries: nodes can interact directly without intermediaries, which includes the ability for nodes to initiate data or digital asset transmission directly (perhaps a proprietary cryptocurrency, such as Bitcoin, or a digital representation of real-world assets, such as land ownership or fiat currency).

— No centralized controller: additions to ledger content or a change to the management structure are subject to negotiation by multiple participants.

— New opportunities to manage and share data: all participants can store and access data in various forms.

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Therefore, blockchain can improve efficiency, trust and data identification for ledger holders.

While this technology is still in its development stage, it is clear that the blockchain has a lot of potential opportunities in many areas. In addition, standardization work related to blockchain is gradually being carried out and Technical Committee ISO/TC 307, *Blockchain and distributed ledger technologies*, has been established.

5.6 P2P

Communication between nodes in the P2P network is the process of data distribution. The tracker obtains the peer list and the node establishes connections with peers in the list based on the TCP protocol. The transmission between peers is realized by several messages, including ‘keepalive’, ‘choke’, ‘un-choke’, ‘interested’, ‘not interested’, ‘bitfield’, ‘request’, ‘piece’, ‘cancel’, ‘have’. The ‘keepalive’ message is empty and used to guarantee the corresponding peer is online. The messages of ‘choke’, ‘un-choke’, ‘interested’, ‘not interested’ are responsible for notifying status information if updated. The other five messages are data messages accountable for transmission between nodes.

6 Business model

Reference data vendors distribute financial-related reference data products to financial market participants. These products vary in terminology, format, number of data elements and scope of coverage. Some proprietary and disparate reference data are supplied by the government, industry groups and private firms. Although these data are free to use, their proprietary nature runs counter to the publicly oriented consensus approach.

Financial market participants and vendors have led efforts to develop standards for financial identifiers and the underlying reference data describing financial instruments. With the development of technology, financial instruments are becoming more diverse and complex and continuously evolving. Every financial instrument represents a contract that governs the relationship between two or more

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parties. Financial instrument reference data describe the terms and conditions of these contracts. The data vary in quality. Improving the quality poses unique challenges. Therefore, financial market participants and suppliers are committed to standardizing the reference data.

Figure 1 illustrates the transmission process of public reference data and financial data standards.

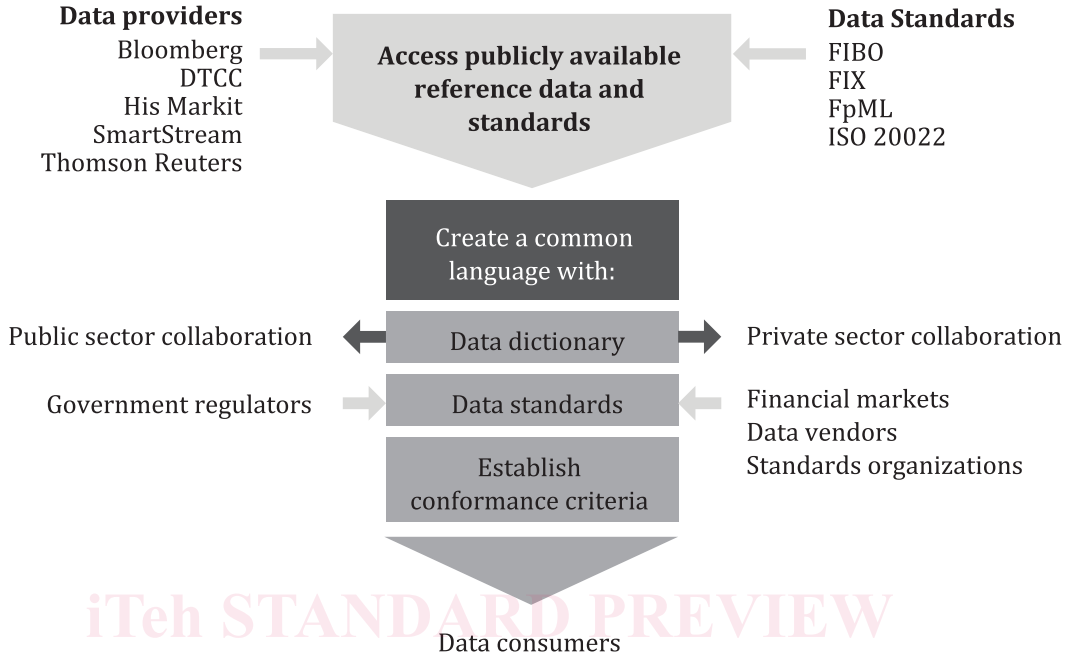

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Figure 1 — Transfer process of public reference data and financial data standards

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7 Logical model

7.1 Logical model

Publishers of reference data publish events, and subscribers subscribe to and receive events based on their interests. The main feature of publish/subscribe is the way notifications flow from senders to receivers. The receiver does not directly target a specific publisher but is indirectly addressed according to the content of the notification. Subscribers express their interested topics by notifying subscriptions on specific notifications, then asynchronously receiving messages that match their subscriptions, where the messages could be from any publishers who publish messages of corresponding topics.

Figure 2 illustrates the publishing and subscribing to the reference data process.

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