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Blockchain and distributed ledger technologies — Reference architecture

Technologies des chaînes de blocs et technologies de registre distribué — Architecture de référence

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 307, *Blockchain and distributed ledger technologies*.

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

Records of transactions, based on certain agreed upon conditions, form the basis for exchanging assets between parties. Businesses and governments have been operating for centuries using this foundation. While physical ledgers were once used, they have largely been replaced with modern technology. However, in traditional approaches, a ledger must be centrally controlled by one or a small number of parties, and other stakeholders must rely on them as agents to change those ledgers.

An important property of a ledger is verifiability. This means that the parties can verify that the set of transactions in the ledger is complete and accurate. As a result, these parties can identify irregularities in transactions, for example, to verify that digital assets of the participants are correctly accounted within a financial ledger. Currently, it is possible to achieve a verifiable ledger in a centralized way by making certain trust assumptions. However, verifiability can be also achieved by distributing the storage and decentralizing the control of the ledger with minimal trust in any one party.

By maintaining a ledger in a distributed network, Distributed Ledger Technology (DLT) systems, including blockchain systems, allow a much wider range of parties to have a shared view of the ledger and to make their own changes to that ledger.

A broad spectrum of DLT based business solutions is possible. This document presents a reference architecture for such DLT based solutions. It starts with the definitions and concepts of blockchain and DLT such as the system organization, nature of access, type of consensus and the roles and responsibilities of the participants. Given that the reference architecture must accommodate a wide variety of possible use cases, it touches upon various business domains and their respective use cases at a high level. Historically, ledgers have facilitated the exchange of assets, but DLT solutions can also be used more broadly for reporting, auditing, and coordination. The document finally presents the reader with various layers of a reference architecture for DLT systems and the functional components in the layers.

This document is relevant to, among other, academics, architects, customers, users, developers, regulators, auditors, and standards development organizations.

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Blockchain and distributed ledger technologies — Reference architecture

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1 Scope

This document specifies a reference architecture for Distributed Ledger Technology (DLT) systems including blockchain systems. The reference architecture addresses concepts, cross-cutting aspects, architectural considerations, and architecture views, including functional components, roles, activities, and their relationships for blockchain and DLT.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22739, *Blockchain and distributed ledger technologies — Vocabulary*

ISO/IEC 24760-1, *IT Security and Privacy — A framework for identity management — Part 1: Terminology and concepts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22739, ISO/IEC 24760-1 and the following 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
activity
specified pursuit or set of tasks

[SOURCE: ISO/IEC 17789:2014, 3.2.1]

3.2
architecture
fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution

[SOURCE: ISO/IEC/IEEE 42010:2011, 3.2]

3.3
behavioural interoperability
interoperability so that the actual result of the exchange achieves the expected outcome

[SOURCE: ISO/IEC 19941:2017, 3.1.6]

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