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Standard

ISO/PRF TR 6039:2021(X2023(E))

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CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: + 41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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).

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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

This document, which is on the available standards and registers of identifiers of subjects and objects ~~with~~ issued by government agencies and standard development organizations (SDOs) (see Annex A), is intended to support designers with the innovation process for their development of (international) blockchain systems for multiple purposes. It also supports the interoperability of those systems with non-blockchain systems because identifiers are mission critical building blocks of information technology systems including the blockchain systems.

~~Identifiers are the data connectors between systems of (public and private) market participants that communicate with each other.~~ Identifiers can identify “subjects” (with rights and obligations) or “objects” (without rights and obligations). This distinction is relevant in legal systems of any country in case at least two subjects of the same or of multiple countries are involved.

~~This document also includes a clause on “decentralised~~ Subclause 4.3 addresses decentralized identifiers that leverage blockchain ~~with a reference to the work of~~ (see W3C [1], [1]). This document is not a report on those “~~decentralised~~ decentralized identifiers” standards and registers.

This document is intended to support designers of blockchain and other systems.

Identifiers issued by the public sector and used in information technology systems are mostly products of a national history (including national legislation) and were mostly not designed for a computer age. This historical legacy hinders the development of ~~the~~ global standards and registers ~~for on~~ the identification of subjects and objects.

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Blockchain and distributed ledger technologies — Identifiers of subjects and objects for the design of blockchain systems

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1 Scope

This document provides an overview of identifiers ~~{(and their standards and register(s))}~~ relevant for the design of blockchain systems and the interoperability of those systems with non-blockchain systems.

The following criteria were used for inclusion of identifiers in this document:

— Identifiers (and their standards and registers) issued by the public sector for subjects and objects such as citizen numbers, business registration numbers or land registration numbers;

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— Identifiers that are internationally ~~recognised~~ recognized and fulfil one of the following criteria below:

— ~~Identifier~~An identifier is an international standard of an SDO (Standard Development Organisation) Organization);

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— ~~Identifier~~An identifier is a de facto standard according to the norms of the industry involved (even if it is not an international standard of an SDO);

— Identifiers that have relevance for DLT systems as it fulfils one of the following criteria below:

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— ~~Identifier~~An identifier that has been used without DLT, but has proven to solve the problems of DLT services using DLT;

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— ~~Identifier~~An identifier that was designed with the usage of DLT in mind from the beginning.

2 Normative references

~~There are no normative references in this document.~~

~~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~~

3 Terms and definitions

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For the purposes of this document, the terms and definitions given in ISO 22739 and the following apply.

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

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

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

3.1 attribute

characteristic or property of an entity

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[SOURCE: ISO/IEC 24760-1:2019, 3.1.3], modified — Example deleted.]

3.2

credential

set of data presented as evidence of a claimed or asserted identity and/or entitlements

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[SOURCE: ISO/IEC 29115:2013, 3.8], modified — Note to entry deleted.]

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3.3

~~DID~~

decentralized identifier

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DID

globally unique persistent identifier that does not require a centralized registration authority and is often generated and/or registered cryptographically

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[SOURCE: W3C Decentralized Identifiers (DIDs) v1.0]

3.4

decentralized identifier subject

DID subject

entity identified by a DID and described by a DID document

[SOURCE: W3C Decentralized Identifiers (DIDs) v1.0]



3.5

entity

item inside or outside an information and communication technology system such as a person, ~~organisation~~ organization, a device, a subsystem, or a group that has recognizable distinct existence

3.6

identifier

attribute or set of attributes that uniquely characterizes an identity in a domain

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Note 1 to entry: An identifier can be a specifically created attribute with a value assigned to be unique within the domain.

[SOURCE: ISO/IEC 24760-1:2019, 3.1.4], modified — Note to entry deleted.]

3.7

object

entity without rights and obligations

3.8

subject

entity with rights and obligations

3.9

verifiable credential

tamper-evident credential that has authorship that can be cryptographically verified

[SOURCE: W3C Verifiable Credentials Data Model v1.1]

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4 Considerations for the design of blockchain systems

4.1 Introduction

4.1 General

Designers of a blockchain system make choices for the design of their application such as:

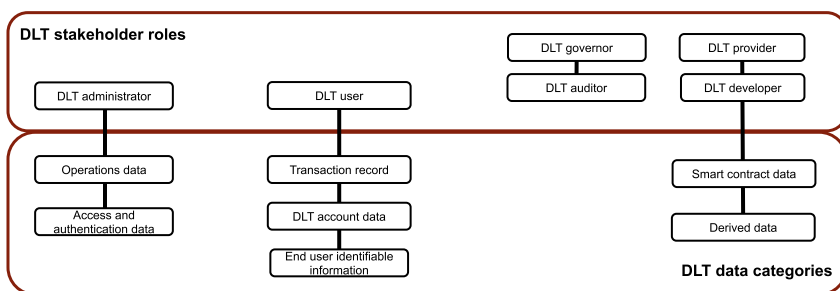
- ~~which~~Which subjects will be included in the DLT service?
- ~~are~~Are the subjects only from one country (such as healthcare insurance) or from multiple countries (such as for the international supply chain)?
- ~~are~~Are the identifiers of subjects of the public sector mandatory for the DLT service or are other options possible (central or ~~decentralised~~decentralized identifiers)?
- ~~which~~Which objects are planned to be included in the DLT service?
- ~~are~~Are the preferred identifiers standards available?
- ~~are~~Are the identifier data registers available and accessible?
- ~~do~~Do the available identifiers and attributes have the required data quality for the DLT service?
- ~~is~~Is the DLT system and its identifiers intended to be used with two (or more) DLT systems and/or with non-DLT systems and/or should interoperability of the two or more systems or applications be ensured to exchange information (data)?

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An overview of subjects (natural persons and legal entities) and an overview of objects such as products, assets, locations, documents, legal rights, and messages are included in this document. Objects are owned by one or more subjects. In this document the object identifiers are distinguished in object identifiers of “horizontal industries” (used by any industry) and object identifiers used by “vertical industries” (used by a specific industry). Annex B provides an overview of identifier categories.

4.2 Reference Architecture

As specified in ISO/TS 23257:2022 [6], [6] DLT data can be classified according to its source as shown in Figure 1. Figure 1.



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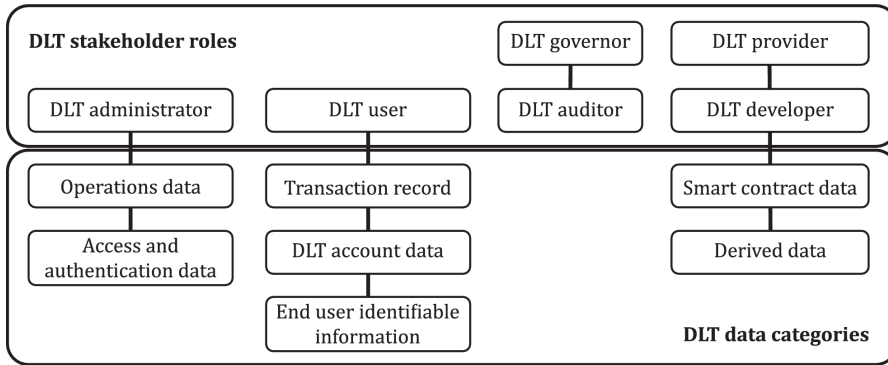
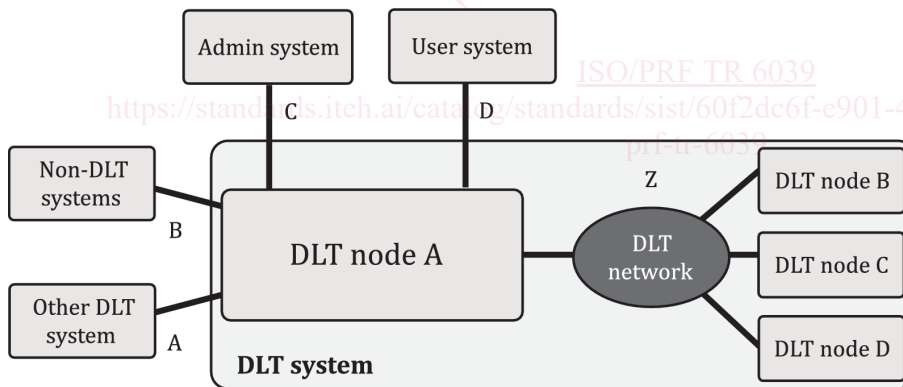


Figure 1 — Data categories from DLT stakeholder role perspective.

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The data sources identified here align with the six DLT roles identified in ISO/TS 23257:2022 [6] as DLT subjects: administrators, users, providers, developers, governors and auditors. Among these, administrators, users and providers are typically the most relevant roles to use case definition. Stakeholders achieve their aims by means of role-based interactions with the DLT system: A specific example could be the data flows of subjects involved in the international supply chain: the exporter and its bank, the customs of the exporter, the freight forwarders, the customs of the importer, the importer and its bank, all those subjects need high quality identifiers of their business partners (and so the customs) involved and of the goods that are shipped.



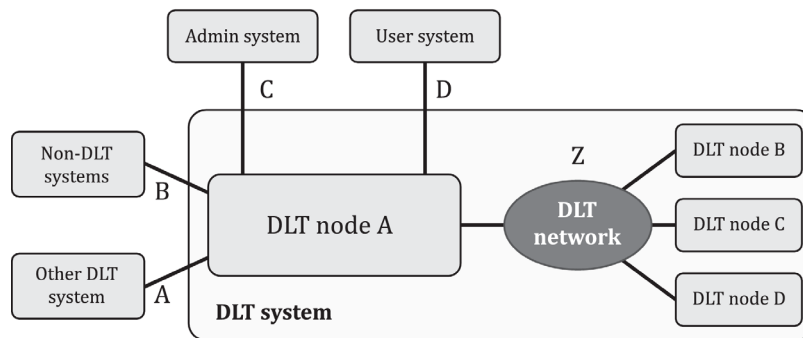
SOURCE: ISO/TR 3242:2022, Blockchain and distributed ledger technologies – Use cases

Figure

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SOURCE: ISO/TR 3242:2022, Figure 4

Figure 2 — Off-chain/on-chain data flow model

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The identifier data (and relevant attributes) of subjects and objects are the data connectors to ensure an efficient end-to-end digital process, mostly via multiple digital ecosystems of the market participants involved. The passing of reference identifiers in the dataflow across on-chain and off-chain systems contributes to the immutable, enhanced trust environment of a DLT system.

Interoperability requires high quality and accurate data (including of identifiers) that are key to correctly recording and tracking the data-related operations of stakeholders to avoid operational risks. There are many definitions of data quality. For this document ISO 8000-8:2015 [7] [7] and ISO/IEC 25012:2008 [8] [8] are regarded as the best excellent references for designers to review the data quality of the identifiers that they will include in their design. See Reference [9] for more information on attributes.

4.3 Decentralised/Decentralized Identifiers

Designers could consider the use of decentralised/decentralized identifiers for their DLT systems. In response to regulatory differences in relation to data privacy (for natural persons identifiers, attributes and data) and governance across global trade ecosystem, two concepts have emerged to address compliance: self-sovereign identity management and decentralised/decentralized identifiers.

Decentralised/Decentralized identifier is an old and established concept. Examples include using a public key or a transformation of it as an identifier and using Universally Unique Identifier [10], [10]. Many addresses used in blockchain systems, such as for cryptocurrencies fall into this category.

W3C has published a framework (Decentralized Identifiers (DIDs) of 19 July 2022) [11], [11] acknowledging a need in some circumstances for a globally unique identifier that is "self-sovereign", that is, one that does not depend on any issuing authority and defining Decentralised/Decentralized identifiers (DIDs) as a new kind of identifier that enables verifiable, decentralised/decentralized identity.

For the design process, a clear view of which subjects and objects is relevant to consider in the DLT system and if all market participants involved will be committed to use a DLT system with decentralised/decentralized identifiers. The designers need also to understand if the DLT system is a stand-alone system or needs to interact with other DLT systems and/or with non-DLT systems of one or more market participants. See Figure 2 [11] See Figure 2 where interoperating DLT and non-DLT systems can be usefully modelled.

Decentralised/Decentralized identifiers are often used in a verifiable credential and are associated with subjects such that the verifiable credential can be easily ported from the repository to another without

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the need to reissue the credential. -W3C has defined that -anything can be a DID subject: person, group, ~~organisation~~organization, physical thing, digital thing, logical thing, etc.-.”

~~According to the W3C's data model, decentralised identifiers (DIDs) are most often used in a verifiable credential and are associated with subjects such that a verifiable credential itself can be easily ported from one repository to another without the need to reissue the credential.~~

The verification of “identifiers (and their attributes)” contained in verifiable credentials with the registers involved is mission critical to ensure the identification of subjects and objects.

This document does not have verifiable credentials in its scope but it lists categories of identifiers and attributes that can be contained as claims in verifiable credentials.

5 Identifiers of subjects

5.1 Introduction

5.1 General

The United Nations ~~has~~members are sovereign states ~~as members~~ [12]. ~~Governments of countries approved~~ [12] Countries stipulate in their legislation how ~~and by whom~~ identifiers for their citizens and ~~for their legal forms and its~~ legal entities are issued ~~in their country~~and who is allowed to use those ~~identifiers for which public or private purpose~~. The government agencies involved that issue the identifiers are regarded the authoritative source of the identifiers and their attributes.

Subjects are entities with rights and obligations according to the legislation of the ~~UN members~~country involved. There are two categories of subjects in ~~any country~~countries: natural persons and legal entities for which government agencies issue unique identifiers.

Governments agencies use their (unique) identifiers (and attributes) for the communication with their citizens for their services and for e-government services inclusive for their social benefits programs. For communication with legal entities, government agencies use the identifier (and attributes) issued by the business register of their jurisdiction. Government agencies sometimes use additional identifiers for specific functions such as tax numbers, VAT numbers, etc. Government identifiers are in general an integral part of the authentication process for citizens and legal entities to get access to e-government services.

Businesses have their own onboarding process for their customers, suppliers and partners and use a CRM (Customer Relationship Management) system with identifiers. The identifier is used for many business processes such as ~~for~~ the invoicing process, reconciliation of payments data, access to ~~the~~ helpdesks, loyalty schemes and ~~for~~ the authentication of the customers, suppliers and partners to specific e-commerce or e-service of the business involved. In several industries, an industry identifier is used for ~~the~~ joint business processes often based on a rulebook, master agreement and/or a common platform.

This ~~chapter~~clause gives an overview of public and private identifiers (and attributes) designers could consider to use for their CRM systems and applications

5.2 Identifiers of natural persons

5.2.1 Public sector identifiers

5.2.1.1 National identity number

The United Nations mention that the civil registration systems for the citizens of a jurisdiction have three basic functions:

- 1) A legal and administrative function;

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- 2) A statistical function;
- 3) The identity management function.

The identity management function assumes that civil registration provides accurate input into an identity management systems or population register. The identity management system also services a legal and identity function. The legal and administrative function of the provision of credentials ~~that enable individuals to prove their identity, and the identity management function being the maintenance of a system for the managing information and credential associated with an~~ identity.

The United Nations stresses that "Everyone has the right to be recognized as a person before the law, as enshrined in ~~Article 6~~Article 6 of the Universal Declaration on Human Rights" ~~[13]~~[13].

The national identification number is used by ~~the~~ government agencies as a means of tracking their citizens, permanent residents and temporary residents for the purpose of work, taxations, government benefits, education, healthcare and other official functions. The issuing of the identification number is stipulated by the legislation of the country involved. Each country has its own standard for the identifier (and attributes) of the citizen record. The access to registers with citizens data is limited by the laws of the country involved. The UN published guidelines on the legislative framework for civil registrations ~~[14]~~[14]. The UN publishes no overview of "national identification numbers". See Reference ~~[15]~~[15] for more information on national identification numbers.

The OECD ~~makes provides~~ an overview ~~available of many of the UN member countries~~ of "tax identification numbers" (TIN) ~~of many of the UN member countries~~, or the functional equivalent for their citizens with the rules of the country involved in relation to the issuance, structure, use and validity of its TIN. See Reference ~~[16]~~[16] for more information.

The authentication schemes of/for government agencies include directly or indirectly the citizen number issued by the government involved.

5.2.1.2 Passport

The ICAO (International Civil Aviation ~~Organisation~~Organization) issues the specifications for machine readable passports. A passport is a travel document (so an object) issued by a government, primarily for the purpose of travel, to certify the personal identity and nationality of its holder. The ICAO specifications ~~[17]~~[17] include mandatory data elements such as:

- the issuing state or ~~organisation~~organization (in code);
- the passport number ~~should~~must uniquely identify the document from all other machine readable documents issued by the state;
- a primary and a secondary identifier as defined by the state.

ISO/IEC 7501-1:2009 ~~[18]~~[18] defines machine readable passports.

5.2.2 Private sector identifiers

Businesses and NGOs design(ed) their own identifier (and attributes) for the registration of their natural person customers or members. These identifiers can include industry standards (such as part of the credit card number). Businesses (such as ~~organisations~~organizations in the financial industry) ~~are often~~must also ~~required to~~often include an identifier issued by a public sector agency of the country involved in the files of their customers. These identifiers mostly can only be used for specific purposes allowed or prescribed by the legislation of the country involved.