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Blockchain and distributed ledger technologies — Taxonomy and Ontology

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ISO copyright office
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

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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.

Introduction

A taxonomy is useful for defining information and data classification rules and for identifying classification items and classification criteria. An ontology aims at clearly showing the concepts that make up the conceptual basis and the vocabulary of the technology under consideration and at creating a foundation that is a prerequisite for understanding the concepts through the definition of their mutual relations (synonyms, inclusions, dependencies, etc.).

A consistent taxonomy is a valuable resource in its own right that also supports and helps to understand other relevant standards.

This document includes a taxonomy of concepts, a taxonomy of DLT systems, and a taxonomy of application domains, purposes and economic activity sections for use cases. This document includes an ontology providing classes and attributes as well as relations between concepts.

Figure 1 shows the relationships between this document and other standards developed by ISO/TC 307.

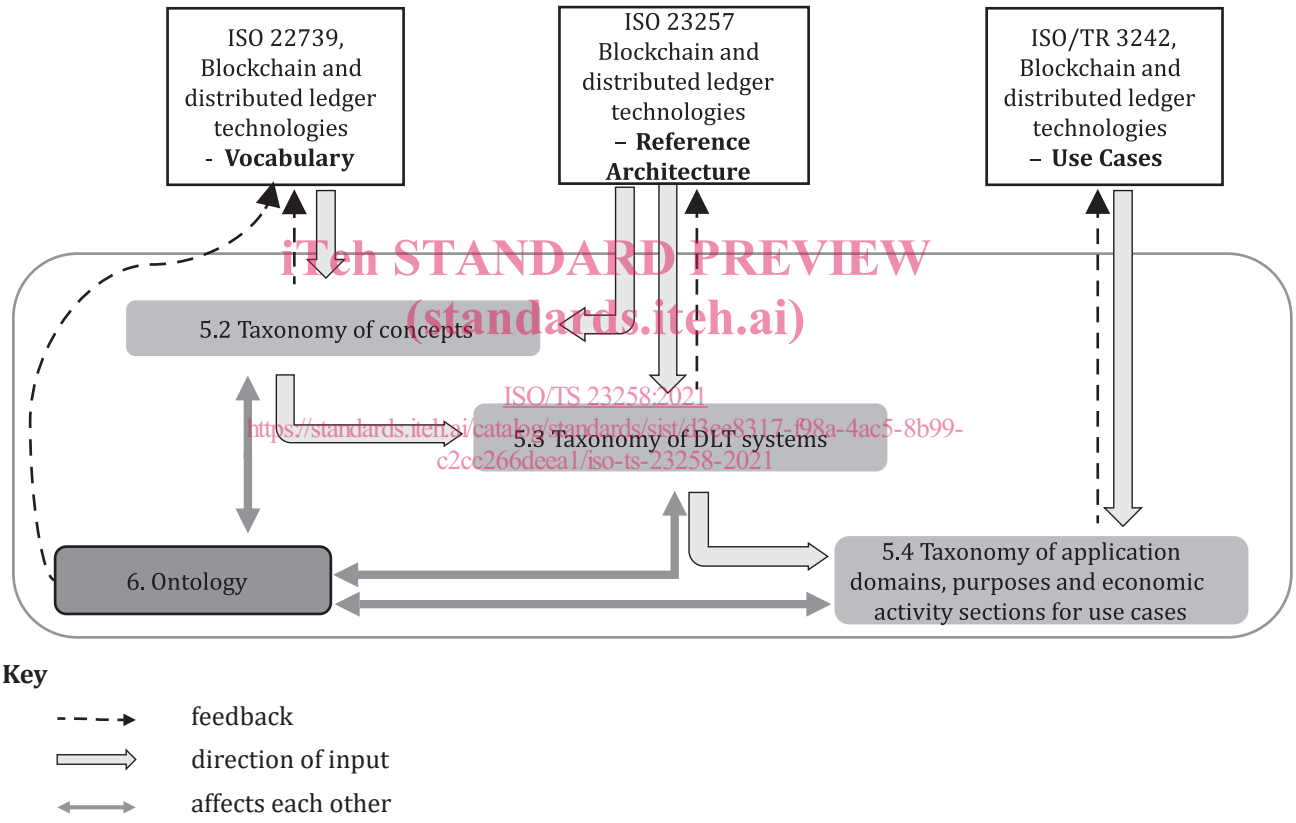

Figure 1 — Relationships between this document and other standards developed by ISO/TC 307

Blockchain and distributed ledger technologies — Taxonomy and Ontology

1 Scope

This document specifies a taxonomy and an ontology for blockchain and distributed ledger technologies (DLT). The taxonomy includes a taxonomy of concepts, a taxonomy of DLT systems and a taxonomy of application domains, purposes and economy activity sections for use cases. The ontology includes classes and attributes as well as relations between concepts.

The audience includes but is not limited to academics, architects, customers, users, tool developers, regulators, auditors and standards development organizations.

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22739 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
taxonomy
scheme of categories and subcategories that can be used to sort and otherwise organize itemized knowledge or information

[SOURCE: ISO 5127:2017, 3.8.6.07]

4 Abbreviated terms

DLT	Distributed Ledger Technology
PoW	Proof-of-Work
PoS	Proof-of-Stake
DPoS	Delegated Proof-of-Stake
BFT	Byzantine Fault Tolerance
PBFT	Practical Byzantine Fault Tolerance
TPS	Transaction Per Second

CA	Certificate Authority
IPFS	InterPlanetary File System
UML	Unified Modeling Language

5 Taxonomy

5.1 Introduction

To better understand DLT systems, it is necessary to classify them into different categories based on their similarities on different aspects. Such classification is also known as the taxonomy of DLT systems. To be able to thoroughly classify and correlate DLT systems, it is imperative to investigate and understand the existing blockchain and distributed ledger technologies as well as the relationships among the DLT system options. This taxonomy helps the potential blockchain users and other stakeholders to compare and choose the right options according to their business needs and applicable legal and regulatory requirements. Furthermore, the ability to classify DLT systems can help with knowledge advancement and can lead to a significant breakthrough in understanding and utilization of DLT systems. Furthermore, the taxonomy informs the scientific research and could support wider understanding and adoption of blockchain and distributed ledger technologies and systems.

5.2 Taxonomy of concepts

Table 1 is based on and refers to the terms and definitions in ISO 22739:2020, ISO 23257:—[1)] and completed with some of the concepts used in Reference [1]. It organizes the concepts into 6-level hierarchical structure with only one entry per concept. Short forms of concepts are given in square brackets and references are provided in parentheses, e.g. "[DLT user (ISO 22739:2020, 3.28)]."

Table 1 — Taxonomy of concepts

Level 1 concepts	Level 2 concepts	Level 3 concepts	Level 4 concepts	Level 5 concepts	Level 6 concepts
Asset (ISO 22739:2020, 3.1)	**Digital Asset** (ISO 22739:2020, 3.20)	Cryptographic Asset (**Crypto-asset** [c]) (ISO 22739:2020, 3.13)	**Cryptocurrency** (ISO 22739:2020, 3.14)		
			Token (ISO 22739:2020, 3.76)	(Token) Fungibility (**Fungible** (ISO 23257:—, 3.12)	Fungible Token
					Non-Fungible Token [NFT]
				Token Metadata	Digital Asset Description
					Privilege Description
					Value Description
	(Asset) **Provenance** (ISO 23257:—, 3.11)	Origin of Asset			
		History of Asset			
		History of Custody			

1) Under preparation. Stage at the time of publication: ISO/FDIS 23257:2021.

Table 1 *(continued)*

Level 1 concepts	Level 2 concepts	Level 3 concepts	Level 4 concepts	Level 5 concepts	Level 6 concepts
Consensus (ISO 22739:2020, 3.11)	**Consensus Mechanism** (ISO 22739:2020, 3.12)	Fault Tolerance	Byzantine Fault Tolerance [BFT]	Practical Byzantine Fault Tolerance [PBFT]	
			Crash Fault Tolerance		
		Nakamoto Consensus	Proof of Stake [PoS]	Delegated Proof of Stake [DPoS]	
			Proof of Work [PoW]		
	Consensus Security				
Smart Contract (ISO 22739:2020, 3.72)	Legally Binding Smart Contract				
Entity (ISO 22739:2020, 3.34)	Legal Entity	Group [a]			
		Organization	Autonomous Organization	Decentralized Autonomous Organization [DAO]	
	Person	Operator	Distributed Ledger Technology Operator [DLT Operator]		
		User	**Distributed Ledger Technology User** (ISO 22739:2020, 3.31) [**DLT User** (ISO 22739:2020, 3.31)]		
	Process	Action	Confirmation	Block Confirmation	
				Transaction Confirmation	
			Compliance		
			Deletion (**Delete** ISO 23257:—, 3.2)	Transaction Deletion	
			Execution	Execution of Contract	Stateful Execution of Contract
					Stateless Execution of Contract
			Validation (ISO 22739:2020, 3.82)	Block Validation	
				Ledger Record Validation	
				Transaction Validation	

Table 1 *(continued)*

Level 1 concepts	Level 2 concepts	Level 3 concepts	Level 4 concepts	Level 5 concepts	Level 6 concepts
		Activity	Archiving (**Archive** ISO 23257:—, 3.3)	**Data Archiving** (ISO 23257:—, 3.4)	
				Resource Archiving	
				Transaction Archiving	
			Hashing		
			Mining (ISO 22739:2020, 3.49)		
			Restoring (**Restore** ISO 23257:—, 3.6)	Data Restoring	
				Resource Restoring	
				Transaction Restoring	
		Event	**Disruption** (ISO 23257:—, 3.10)	Attack	
				Incident (ISO 23257:—, 3.8)	
			Error	Error analytics	
			Failure (ISO 22739:2020, 3.35)		
			Fault	**Fault Tolerance** (ISO 22739:2020, 3.36)	
			Fork (ISO 22739:2020, 3.45)	**Hard Fork** (ISO 22739:2020, 3.38)	
				Soft Fork (ISO 22739:2020, 3.73)	
		Work Process	**Backup** (ISO 23257:—, 3.5)	Data Backup	
				Resource Backup	
				Transaction Backup	
			Transaction (ISO 22739:2020, 3.77)		
	Thing	Object	Device		

Table 1 *(continued)*

Level 1 concepts	Level 2 concepts	Level 3 concepts	Level 4 concepts	Level 5 concepts	Level 6 concepts
			Node (ISO 22739:2020, 3.50)	Child Node	
				Distributed Ledger Technology Node [**DLT Node** (ISO 22739:2020, 3.27)] [b]	**Miner** (ISO 22739:2020, 3.48)
					Participant
					Validator (ISO 22739:2020, 3.83)
				Leaf Node (ISO 22739:2020, 3.42)	
				Non-Leaf Node	
				Parent Node	
				Peer	
				Root Node (ISO 22739:2020, 3.69)	(Node) **Merkle Root** (ISO 22739:2020, 3.46)
			Platform	**Distributed Ledger Technology Platform** [**DLT Platform** (ISO 22739:2020, 3.29)]	
Governance	Control	Decentralized Control			
	Governance Rule				
	Incentive	**Incentive Mechanism** (ISO 22739:2020, 3.68)	**Reward System** (ISO 22739:2020, 3.68)	**Block Reward** (ISO 22739:2020, 3.5)	
Interoperability (ISO 22739:2020, 3.41)	Transport Interoperability				
	Syntactic Interoperability				
	Semantic Interoperability				
	Behavioral Interoperability				
	Policy Interoperability				

Table 1 *(continued)*

Level 1 concepts	Level 2 concepts	Level 3 concepts	Level 4 concepts	Level 5 concepts	Level 6 concepts
Ledger (ISO 22739:2020, 3.43)	**Distributed Ledger** (ISO 22739:2020, 3.22)	**Blockchain** (ISO 22739:2020, 3.6)			
		Distributed Ledger Control	Distributed Ledger Control Architecture		
		Distributed Ledger Privilege			
		Distributed Ledger Pruning (**Prune** (ISO 22739:2020, 3.63)			
		Distributed Ledger Storage	Distributed Ledger Storage Architecture		
		Shared Ledger (ISO 22739:2020, 3.70)			
	Ledger Implementation	**Block** (ISO 22739:2020, 3.2)	**Block Data** (ISO 22739:2020, 3.3)		
			Block Header (ISO 22739:2020, 3.4)	(Block) **Hash Value** (ISO 22739:2020, 3.39)	
				(Block) Merkle Root	
				(Block) **Nonce** (ISO 22739:2020, 3.51)	
				Block Number (or Block Height)	**Genesis Block** (ISO 22739:2020, 3.37)
					Previous Block
				(Block) **Timestamp** (ISO 22739:2020, 3.75)	
			Block Status	**Confirmed** (ISO 22739:2020, 3.8) **Block** (ISO 22739:2020, 3.9)	
				Validated (ISO 22739:2020, 3.81) Block	