

Recommendation

ITU-T X.1413 (05/2025)

SERIES X: Data networks, open system communications and security

Secure applications and services (II) – Distributed ledger technology (DLT) security

Security controls for distributed ledger technology

ITU-T X-SERIES RECOMMENDATIONS

Data networks, open system communications and security

PUBLIC DATA NETWORKS	X.1-X.199
OPEN SYSTEMS INTERCONNECTION	X.200-X.299
INTERWORKING BETWEEN NETWORKS	X.300-X.399
MESSAGE HANDLING SYSTEMS	X.400-X.499
DIRECTORY	X.500-X.599
OSI NETWORKING AND SYSTEM ASPECTS	X.600-X.699
OSI MANAGEMENT	X.700-X.799
SECURITY	X.800-X.849
OSI APPLICATIONS	X.850-X.899
OPEN DISTRIBUTED PROCESSING	X.900-X.999
INFORMATION AND NETWORK SECURITY	X.1000-X.1099
SECURE APPLICATIONS AND SERVICES (I)	X.1100-X.1199
CYBERSPACE SECURITY	X.1200-X.1299
SECURE APPLICATIONS AND SERVICES (II)	X.1300-X.1499
Emergency communications	X.1300-X.1309
Ubiquitous sensor network security	X.1310-X.1319
Smart grid security	X.1330-X.1339
Certified mail	X.1340-X.1349
Internet of things (IoT) security	X.1350-X.1369
Intelligent transportation system (ITS) security	X.1370-X.1399
Distributed ledger technology (DLT) security	X.1400-X.1429
Application Security (2)	X.1450-X.1459
Web security (2)	X.1470-X.1489
CYBERSECURITY INFORMATION EXCHANGE	X.1500-X.1599
CLOUD COMPUTING SECURITY	X.1600-X.1699
QUANTUM COMMUNICATION	X.1700-X.1729
DATA SECURITY	X.1750-X.1799
INTERNATIONAL MOBILE TELECOMMUNICATIONS (IMT) SECURITY	X.1800-X.1839
METaverse AND DIGITAL TWIN SECURITY	X.2000-X.2199
SOFTWARE SUPPLY CHAIN SECURITY	X.2150-X.2199
ARTIFICIAL INTELLIGENCE (AI) / MACHINE LEARNING (ML) SECURITY	X.2200-X.2249

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T X.1413

Security controls for distributed ledger technology

Summary

Distributed ledger technology (DLT) uses immutable digital ledger systems implemented in a distributed fashion (i.e., without a central repository) and typically without a central authority. There are two different main models through which DLT is implemented. DLT has other important features that include smart contracts and DLT oracle.

Security controls vary with different implementation models of DLT, as do different features such as access control, consensus algorithm, smart contracts. Recommendation ITU-T X.1413 mainly covers the varying security controls that can be referenced when implementing, evaluating or auditing systems with distributed ledger technology.

History *

Edition	Recommendation	Approval	Study Group	Unique ID
1.0	ITU-T X.1413	2025-05-29	17	11.1002/1000/16382

Keywords

Audit, consensus mechanism, DLT models, DLT oracle, smart contract.

* To access the Recommendation, type the URL <https://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID.

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Table of Contents

		Page
1	Scope.....	1
2	References.....	1
3	Definitions	1
	3.1 Terms defined elsewhere	1
	3.2 Terms defined in this Recommendation.....	2
4	Abbreviations and acronyms	2
5	Conventions	2
6	Introduction.....	2
7	DLT governance for security.....	3
	7.1 General	3
	7.2 Permissionless model	3
	7.3 Permissioned model.....	4
8	DLT security policies	5
	8.1 Control.....	5
	8.2 Purpose	5
	8.3 Implementation guidance	5
	8.4 Other information	5
9	Smart contract security	5
	9.1 Control.....	5
	9.2 Purpose	5
	9.3 Implementation guidance	5
10	DLT node management security.....	6
	10.1 Control.....	6
	10.2 Purpose	6
	10.3 Implementation guidance	6
11	Consensus mechanism security	7
	11.1 Control.....	7
	11.2 Purpose	7
	11.3 Implementation guidance	7
12	DLT oracle security	8
	12.1 Control.....	8
	12.2 Purpose	8
	12.3 Implementation guidance	8
13	DLT audit.....	8
	13.1 Control.....	8
	13.2 Purpose	8
	13.3 Implementation guidance	8

	Page
Appendix I – DLT audit processes and items	10
Bibliography.....	13

Recommendation ITU-T X.1413

Security controls for distributed ledger technology

1 Scope

This Recommendation provides security controls from the perspective of governance, technology, and audit on necessary security controls when applying distributed ledger technology to a system. The contents covered by security controls related to distributed ledger technology include the following areas: DLT governance, smart contract, DLT node management, consensus mechanism, DLT oracle and DLT audit.

The Recommendation is intended for organizations that would select and implement appropriate security controls for the distributed ledger technology which they run or use. Also, this Recommendation can be used by organizations that would assess and evaluate security of systems or services on distributed ledger technology.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ISO 23257] ISO 23257:2022, *Blockchain and distributed ledger technologies – Reference architecture*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 consensus [b-ISO 22739]: Agreement among DLT nodes that 1) a transaction is validated, and 2) that the distributed ledger contains a consistent set and ordering of validated transactions.

3.1.2 control [b-ISO/IEC 27000]: A measure that is modifying risk.

NOTE 1 – Controls include any process, policy, device, practice, or other actions which modify risk.

NOTE 2 – Controls may not always exert the intended or assumed modifying effect.

3.1.3 distributed ledger [b-ITU-T X.1400]: A type of ledger that is shared, replicated and synchronized in a distributed and decentralized manner.

3.1.4 distributed ledger technology governance [b-ISO 22739]: A system of directing and controlling DLT system including the distribution of on-ledger and off-ledger decision rights, incentives, responsibilities and accountabilities.

NOTE – Blockchain is a type of distributed ledger (see clause 6.8 of [b-ITU-T X.1400]).

3.1.5 distributed ledger technology platform [b-ISO 22739]: A set of processing, storage and communication entities which together provide the capabilities of the DLT system on each DLT node.

3.1.6 distributed ledger technology system [b-ISO 22739]: A system that implements a distributed ledger.