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GROUP REPORT

Permissioned Distributed Ledger (PDL); Landscape of Standards and Technologies

Disclaimer

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Foreword

This Group Report (GR) has been produced by ETSI Industry Specification Group (ISG) Permissioned Distributed Ledger (PDL).

Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

Standards are everywhere and are playing a key role to protect consumers, workers and environment. Blockchain and Distributed Ledger Technologies represent a key performance indicator for the Standardization Bodies and Organizations worldwide. First initiative was launched by ISO in 2016, as an initiative from Australian mirror Committee which conformed the Committee ISO/TC 307 [i.1] with the Scope "Standardisation of Blockchain technologies and distributed ledger technologies".

Following the aim of standardization at the European level, CEN-CENELEC conformed a Focus Group [i.2] for Blockchain and Distributed ledger technologies in 2017 which is under liaison with ISO TC307 and a White Paper "Recommendations for Successful Adoption in Europe of Emerging Technical Standards on Distributed Ledger/Blockchain Technologies" [i.2] was approved and published by CEN-CENELEC in 2018.

At United Nations level, the International Telecommunication Union is working very efficient with various Study Groups and related materials and it is relevant the Focus Group [i.5] on Application of Distributed Ledger Technology in May 2017.

There are also initiatives and programs which are focus on standardization like the Joint Initiative on Standardization under the Single Market Strategy [i.3] which is a voluntary collaborative effort and does not establish any new legal commitments whereby Standards are key for innovation and progress within the European competitiveness. Basically, this Joint Initiative on Standardization sets out a shared vision for European standards in order to take steps to better prioritize and to modernize the current European Standardization system, as well as to strive for the timely delivery of standardization deliverables. It supports the relevant aspects of the ten European Commission's Priorities and other policy objectives, while clearly respecting the distribution of different competences between the EU and the Member States.

The European Blockchain Observatory and Forum (https://www.eublockchainforum.eu/) is an open project to create most comprehensive map of the European Blockchain ecosystem and as European Commission Initiative to accelerate blockchain innovation and the development of blockchain ecosystem within the EU and so help cement Europe's position as a global leader in this transformative new technology.

There are also other alternative efforts related to the standardization of some properties that DLTs can provide which are considered within the present document like W3C (https://www.w3.org/) or https://opentimestamps.org/.

1 Scope

The present document will identify current activities in standardization and in research which are particularly relevant to PDL, with the goal of identifying applicable solutions, required enhancements and recommendations for further collaboration. As appropriate, activities of professional or non-profit initiatives will also be considered.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ISO/TC 307: "Blockchain and distributed ledger technologies".

NOTE: Available at https://www.iso.org/committee/6266604.html.

[i.2] CEN-CENELEC Focus Group on Blockchain and Distributed Ledger Technologies: "Recommendations for Successful Adoption in Europe of Emerging Technical Standards on Distributed Ledger/Blockchain Technologies".

NOTE: Available at ftp://ftp.cencenelec.eu/EN/EuropeanStandardization/Sectors/ICT/Blockchain%20+%20DLT/FG-BDLT-White%20paper-Version1.2.pdf.

[i.3] European Commission: "The Single Market Strategy".

NOTE: Available at https://ec.europa.eu/growth/single-market/strategy_en.

[i.4] ISO/TR 23455:2019: "Blockchain and distributed ledger technologies -- Overview of and interactions between smart contracts in blockchain and distributed ledger technology systems".

NOTE: Available at https://www.iso.org/standard/75624.html.

[i.5] ITU Focus Group on Application of Distributed Ledger Technology.

NOTE: Available at https://www.itu.int/en/ITU-T/focusgroups/dlt/Pages/default.aspx.

[i.6] W3C Recommendation 19 November 2019: "Verifiable Credentials Data Model 1.0".

NOTE: Available at https://www.w3.org/TR/vc-data-model/

[i.7] Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market.

[i.8]   European Commission JRC Science for Policy Report: "Licensing Terms of Standard Essential Patents".

NOTE: Available at
           https://publications.jrc.ec.europa.eu/repository/bitstream/JRC104068/jrc104068%20online.pdf

[i.9]   European Commission Internal Market, Industry, Entrepreneurship and SMEs: "Landscaping study of standard essential patents in Europe".

NOTE: Available at http://ec.europa.eu/growth/content/landscaping-study-standard-essential-patents-europe-0_en.

[i.10]   Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation, amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No 1673/2006/EC of the European Parliament and of the Council.

[i.11]   Geospatial Standardization of Distributed Ledger Technologies.

3   Definition of terms, symbols and abbreviations

3.1   Terms

Void.

3.2   Symbols

Void.

3.3   Abbreviations

For the purposes of the present document, the following abbreviations apply:

AI	Artificial Intelligence
AML	Anti-Money Laundering
API	Application Programming Interface
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CFT	Counter-Financing of Terrorism or Combating the financing terrorism
CLC	CENELEC
CTN	Technical Committee of Standardization (Comité Técnico de Normalización)
DAO	Decentralized Autonomous Organization
DIN	Decentralized Internet Infrastructure
DINRG	Decentralized Internet Infrastructure Research Group
DLT	Distributed Ledger Technology
EBP	European Blockchain Partnership
EBSI	European Blockchain Service Infrastructure
EC	European Commission
EEA	Enterprise Ethereum Alliance
EFTA	European Free Trade Association
eIDAS	Electronic Identification, Authentication and Trust Services
EIRA	European Interoperability Reference Architecture
ESSIF	European Self Sovereign Identity Framework
ETSI	European Telecommunication Standards Institute
EU	European Union
FG	Focus Group

FIG   International Federation of Surveyors
FRAND   Fair, Reasonable and Non-Discriminatory
GDPR   General Data Protection Regulation
H2020   Horizon 2020
HE   Horizon Europe
ICO   Initial Coin Offering
ICT   Information and Communications Technology
INATBA   International Association for Trusted Blockchain Applications
IoT   Internet of Things
IRTF   Internet Research Task Force
ISO   International Standards Organization
ITU   International Telecommunication Union
ITU-T   International Telecommunication Union-Telecommunications standardization sector.
JTC   Joint Technical Committee
KYC   Know Your Customer
OECD   Organization for Economic Co-operation and Development
OGC   Open Geospatial Consortium
OMA   Open Mobile Alliance
PDL   Permissioned Distributed Ledger
PIA   Privacy Impact Assessment
PKI   Public Key Infrastructure
PR   Property Rights
RG   Research Group
SBS   Small Business Standards
SC11   Sub-Committee 11.
SDO   Standard Developing Organization
SEP   Standards-Essential Patents
SG   Study Group.
SME   Small and Medium Enterprise
STO   Security Token Offering
TOOP   The Once-Only Principle
TSAG   Telecommunication Standardization Advisory Group
UN/CEFACT   United Nations Centre for Trade Facilitation and Electronic Business
UNCITRAL   United Nations Commission on International Trade Law
UNE   Spanish Association for Standardization
WS   Work-Shop

4   Introduction to main areas of application of PDL technologies and role of standards

Distributed Ledgers Technology is categorized as a General Purpose Technology and as such can provide benefits to a large number of applications across most industries. Applications that use PDL technologies will benefit from distributed trusted databases with recorded verifiable transactions which can be automated to increase efficiency and reduce costs.

Typical applications, industrialized and emerging, may be divided into horizontal applications which provide common functions, and vertical applications that serves a more specific industry application typically leveraging one or more horizontal application. Some examples below.

Table 1: Main Areas of PDL Applications

| HORIZONTAL DOMAIN	VERTICAL DOMAIN
Identity Management: individuals, objects, legal entities and processes	eGovernment: Properties, benefits records
Data Management: data sharing	Healthcare: Health records, Prescriptions
Logistics and Supply-Chain	Industries: Manufacturing distribution
Security Management	Automotive and IoT: Supply chain, data integrity, Autonomous vehicles
Digital Evidence	Commerce, digital evidence admissible in court
Invoicing Management	Finance: securities trading, Trade finance, Micro-credits and remitance, insurance
Crypto-structures and DAO	Utilities: Share records and trading, Energy Sector, Smart-Metering, Smart-grids, Telecommunications, Water and Waste management.
Contract Management: Smart Contracts	Media and Social Media: Intellectual Properties management, e-Sport, Culture, Art, Advertisement
Commodity Management	Yield management, Agriculture
Decision Management: A.I.-decision traceability	Education: e-learning, Diplomas validation
Privacy management	Healthcare, Automotive and IoT, Commerce, Finance-securities trading, Utilities
Infrastructure Management	ICT: Internet resource management, Trust infrastructure (e.g. PKI), Network security

The many initiatives have created a fragmented market and many reports states the lack of standards as a significant barrier to adoption. Several initiatives are ongoing and examples of where standards can help include terminology, interoperability, security, privacy and data management.

AI- data traceability: AI is a number of technologies of data processing nature that may assist decision making. The use of AI may be validated and enhanced by traceability. The traceability of a number of data management processes involving machine, scripting and human processing may be enhanced with the use of AI and its functionality.

5   Current activities in standardization

5.1   International Standards Organization (ISO TC-307)

ISO/TC 307 [i.1] Blockchain and Distributed Ledger Technologies since 2016 has 43 participating members and 13 observing members. It has liaisons committees to ISO/TC 307 and from ISO/ TC307. And it is relevant the Joint Working Groups ISO/TC46/SC11/JWG1 with title Joint ISO/TC46/SC 11-ISO/TC 307 WG: Blockchain. There are also organizations in liaison like European Commission, Enterprise Ethereum Alliance Inc, Institute of Electrical and Electronic Engineers Inc, ITU, OECD, SWIFT, UNECE and International Federation of Surveyors.
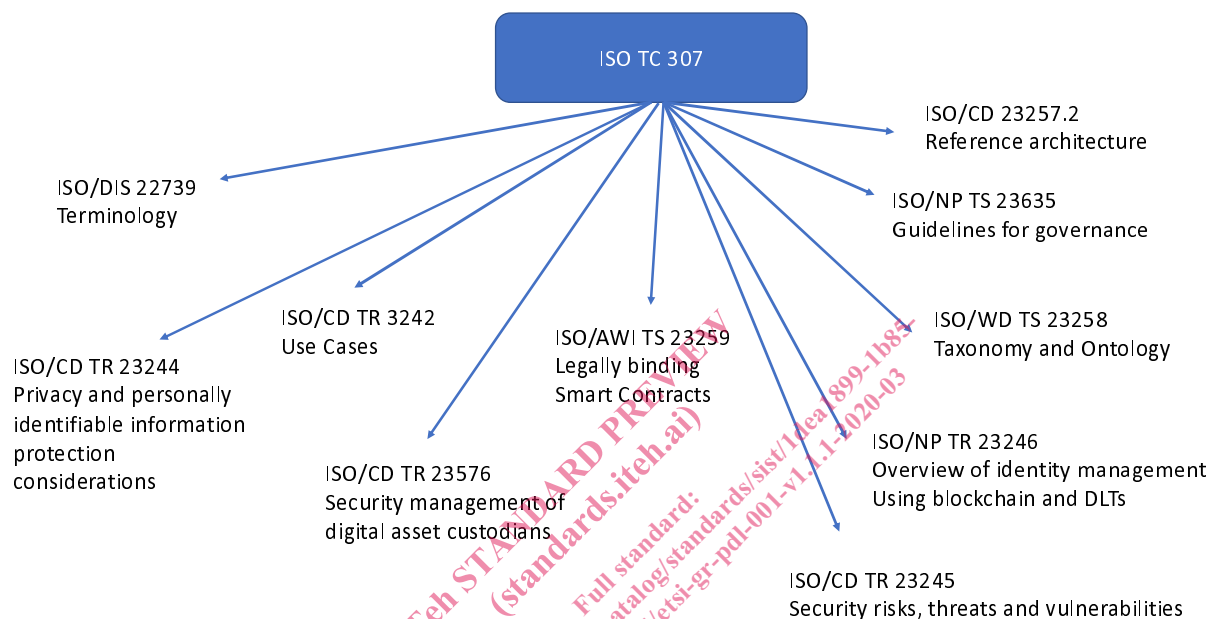
NOTE: ISO/TR 23455:2019 [i.4] overview of and interactions between Smart Contracts and DLT systems is published already.

Figure 1: ISO TC307 - Standards under development

5.2   CEN-CENELEC FGBDLT

CEN-CENELEC: CEN (European Committee for Standardization) and CENELEC (European Committee for Electrotechnical Standardization) are recognized by the EU and EFTA as European Standardization Organizations responsible for developing standards at European level. These standards set out specifications and procedures in relation to a wide range of materials, processes, products and services. The members of CEN-CENELEC are the National Standardization Bodies and National Electrotechnical Committees of 34 European countries. European Standards and other standardization deliverables adopted by CEN-CENELEC are accepted and recognized in all these countries. For Blockchain and Distributed Ledger Technologies the Focus Group in 2019 will identify specific European needs and release a new version of its technical white paper for the successful implementation of Blockchain and DLT in Europe.