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**Group REPORT**

Permissioned Distributed Ledger (PDL);

Application of PDL to Amended Regulation 910/2014 (eIDAS 2) Qualified Trust Services

<

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# Foreword

This Group Report (GR) has been produced by ETSI Industry Specification Group <long ISGname> (<short ISGname>).

# Modal verbs terminology

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# Introduction

To be added covering:

- Background of PDL

- Data act

- eIDAS 2 and EUDI Framework

# 1 Scope

The present document describes the features of a PDL to be applicable as a qualified electronic ledger and in support for eIDAS 2 trust services. The document analyses the properties that a PDL can have to be an enabler for eIDAS 2, for authentication and identification, and also for using eIDAS 2 in other areas of the Digital Economy.

# 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] EU Regulation amending Regulation (EU) No 910/2014 as regards establishing a framework for a European Digital Identity (eIDAS 2)

Editor’s note trilogue draft currently available
<https://www.europarl.europa.eu/committees/en/european-digital-identity-provisional-ag/product-details/20231116CAN72103>
Publication of the present document should be deferred until the formal ratification which is currently expected early 2024

[i.2] ISO /TS 23635:2022: Blockchain and distributed ledger technologies Guidelines for governance

[i.3] ETSI EN 319 422 Electronic Signatures and Infrastructures (ESI); Time-stamping protocol and time-stamp token profiles

[i.4] ETSI TS 119 102-2 Electronic Signatures and Infrastructures (ESI); Procedures for Creation and Validation of AdES Digital Signatures; Part 2: Signature Validation Report

[i.5] ETSI EN 319 411-1 Electronic Signatures and Infrastructures (ESI); Policy and security requirements for Trust Service Providers issuing certificates; Part 1: General requirements

[i.6] ETSI Work item DTS 019 472-1 Profiles for Electronic Attestations of Attributes Part 1: Profiles for Electronic Attestations of Attributes - General requirements

[i.7] EN 319 522 parts 1 to 4 Electronic Signatures and Infrastructures (ESI); Electronic Registered Delivery Services

# 3 Definition of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the [following] terms [given in ... and the following] apply:

Trust Service [as in eIDAS 2]

Trust Service Provider [ as in eIDAS 2]

 Permissioned Distributed Ledger ??

## 3.2 Abbreviations

For the purposes of the present document, the [following] abbreviations [given in ... and the following] apply:

eIDAS 2 EU Regulation amending Regulation (EU) No 910/2014 as regards establishing a framework for a European Digital Identity[1]

PDL Permissioned Distributed Ledger

TSP Trust Service Provider

QTSP Qualified Trust Service Provider under eIDAS 2

# 4 Features of PDL

## 4.1 Common Context

PDL, in nature, is a permissioned electronic ledger which is distributed. The capabilities to configure automated process which are permissioned fit into more possibilities for regulatory frameworks to provide legal certainty with distributed ledgers which usually are not single-jurisdictional governance model instead of multi-jurisdictional governance model. The European Union and the efforts for the Digital Single Market in the European space represent per se a multi-jurisdictional governance model which can be harmonised for specific requirements when a distributed ledger is being used like EBSI (European Blockchain Services Infrastructure).

The present document does not consider the alternative approaches to identification and authentication commonly associated with distributed ledgers such as use of decentralised identifiers, and the electronic identification, authentication and signature services of eIDAS 2.

## 4.2 Properties

The main properties of a PDL are:

* Immutably: The content of the ledger cannot be changed
* Integrity: Any change to an individual record once placed in the ledger can be detected.
* Sequence: Any change to the sequence of records in a ledger can be detected
* Persistent: The above properties are not time-limited
* Verifiable / auditable: The above properties can be checked independent of any provider of ledger services.
* Accountable: Each members of a PDL can be held to account for the provision of its services.

Non-essential properties of a PDL which may be provided using services external to the PDL

* The identity of the originator of a record
* The time at which a record was added to the ledger

PDL is based upon multi-party provision of a distributed ledger with consensus and synchronisation protocols between the parties ensuring an agreed content of the ledger.

PDL is also based on governance with permission the ledger providers.

## 4.3 Governance

### 4.3.1 Principles

Principles of governance of a distributed ledger, including a PDL, based on ISO/TS 23635:2022 are as follows:

|  |  |
| --- | --- |
| ISO /TS 23635:2022 | PDL |
| Principle 1: Define identifiers of entities involved | Through PDL governance, the entities providing ledgers are identifiable within the community. In addition, the identity of the node originating data record is identifiable. |
| Principle 2: Enable decentralized decision-making | Decentralised within scope of governance domain as distributed across several nodes. Collective decisions recorded explicitly on ledger. |
| Principle 3: Ensure explicit accountability |  Through the PDL governance the responsibilities and liabilities of the identified PDL providers can be clearly defined. |
| Principle 4: Support transparency and openness | .The governance regime needs to be able to detect if rules for the operation of PDL are not applied. Entities can participate in a PDL provided that they meet the governance criteria provided rule.The transparency and openness needs to be within the limits of GDPR |
| Principle 5: Align incentive mechanisms with system objectives | A PDL governance regime can define equitable alignment for scalable solutions and services based on incentives from a wide range of options. Also it represents a beneficial participatory with the objectives of the PDL itself. |
| Principle 6: Provide performance and scalability | Monitoring tools and services allow to practice performance and scalable perspective, as well as surveillance mechanism that can anticipate mal-functional or risky areas of performance. |
| Principle 7: Make risk-based decisions and address compliance obligations | The nodes participating in the chain together enforce the rules for the chain though the protocol exchanges. Further governance rules on nodes participating in the chain for a particular business need are applied through the process of grating permission. |
| Principle 8: Ensure security and privacy | A PDL governance regime may stablish policy requirements for various purposes and have to secure automated scenarios to avoid breaches of privacy based on the operations of the different products and services within the PDL and from the PDL with the real world. |
| Principle 9: Consider interoperability requirements | Due to the facts that permission requires different paths for interoperate in due conditions, it represents as well, weather direct or indirect tools for interoperability with other governance regimes. A PDL can accommodate also unidirectional interoperability requirements which it does not affect to both PDL interaction but allow the interoperability. |

### 4.3.2 Factors to be considered in a Governance Regime

A PDL may apply across jurisdictions provided they apply the requirements of the governance regime enforced through a form of legally recognised agreement such as a contract or multi-national agreement.

# 5 Features of eIDAS 2 Qualified Trust Services

## 5.1 eIDAS 2 trust services

Amended Regulation 910/2014 [1] (commonly referred to as eIDAS 2) provides a regulatory framework for the provision of electronic identities and trust services. This defines specific types of third party “trust services” supporting the security of electronic transactions. This is primarily aimed at the European internal market but can be applied internationally. Within eIDAS 2 trust services are limited to those services which are provided commercially. Government provided services, which are generally funded through taxation, are not considered trust services under eIDAS 2.

The concept of trust service was initially applied to services issuing public key certificates in support digital signatures, legally referred to in eIDAS 2 as advanced electronic signatures or seals. Issuance of certificates in support of digital signatures remains the main type of trust service used within Europe and this type of trust service is becoming recognised internationally. Currently, 9 trust services types are recognised in the current eIDAS 2 regulation, all of which have been implemented by a number of trust service providers. Trust services were previously defined in regulations EU 910/2014 as services for:

1. the creation, verification, and validation of electronic signatures, electronic seals or electronic time stamps, electronic registered delivery services and certificates related to those services, or
2. the creation, verification and validation of certificates for website authentication; or
3. the preservation of electronic signatures, seals or certificates related to those services.

This is extended in eIDAS 2 for recognised trust services also to include:

1. the electronic archiving of electronic documents;
2. the management of remote electronic signature and seal creation devices;
3. the recording of electronic data into an electronic ledger

## 5.2 Qualified Trust Service Providers

eIDAS 2 give specific recognition for the provision of trust services which meet particular requirements as identified in the eIDAS 2 regulation. A trust service provider which meet these requirements are referred to as a “Qualified Trust Service Provider” (QTSP). The requirements for being a QTSP include:

1. requirements to take appropriate technical and organisational measures (applicable to both qualified and non-qualified trust service providers),
2. requirements for notification of security breaches (applicable to both qualified and non-qualified trust service providers),
3. requirements for the cybersecurity of essential services under NIS 2 [ref]
4. requirements for personal data protection such as in GDPR [ref]
5. requirements for the provision of Qualified trust services
6. requirements for the particular type of Qualified trust service.

The QTSPs which are recognised as meeting the requirements of trust service

eIDAS 2 Article 14 cross recognition of qualified trust service providers can be requires recognition either under an implementing act issued by the EU or through legal agreement.

## 5.3 Specific Requirements of EU Qualified Electronic Ledgers

The specific legal requirements on electronic ledgers as given in the eIDAS 2 regulation [1] are as follows

Article 3 (53) ‘electronic ledger’ means a sequence of electronic data records, ensuring their integrity and the accuracy of their chronological ordering; Article 45i: Requirements for qualified electronic ledgers

1. Qualified electronic ledgers shall meet the following requirements:

(a) they are created and managed by one or more qualified trust service provider or providers;

(b) they establish the origin of data records in the ledger;

(c) they ensure the unique sequential chronological ordering of data records in the ledger ;

(d) they record data in such a way that any subsequent change to the data is immediately detectable, ensuring their integrity over time.

2. Implementing acts are required 12 months after eIDAS 2 comes into force establishing a list of reference standards and when necessary, establish specifications and procedures for the requirements laid down in paragraph 1 (above) .

## 5.4 Governance and Audit Requirements

Qualified Trust Service Providers (QTSP), including providers of Qualified Electronic Ledgers, are supervised by a national authority to ensure that they meet the functional and security requirements of the eIDAS 2 regulation. The acceptance of a Qualified Trust Service as meeting the regulatory requirements is based on an audit by a “Conformity Assessment Body” accredited under EU regulations. It is common for the audit to be based on assessment of Policy and Security Requirements for the provision of particular trust service defined by ETSI.QTSPs who are recognised under the eIDAS 2 supervisory scheme are included in Trusted List which identifies the trust services supported and a public key certificate which identifies the provider of the trust service.

# 6 PDL and eIDAS 2 Trust Services

## 6.1 Introduction

Combining PDL community governance and eIDAS 2 audit & supervision

(use concepts in PDL 15 & PDL 12 as relevant)

## 6.2 PDL as stand alone Trust Service

### 6.2.1 Requirements for Qualified Electronic Ledgers vsFeatures of PDL

**Ledger Specific Requirements**

|  |  |  |
| --- | --- | --- |
| **eIDAS 2 Article 45i Requirements on Qualified Electronic Ledgers:** | **PDL Properties** | **Assessment** |
| (a) they are created and managed by one or more qualified trust service provider or providers | Multi-party: Based on consensus between multiple ledger providers | PDL is always multiparty. Whereas eIDAS 2 only addresses requirements of one QTSP.  |
| (b) they establish the origin of data records in the ledger; | Identity of origins not essential.  | PDL identifies the node originating data record included in chain.May use pseudonym within the PDL. |
| (c) they ensure the unique sequential chronological ordering of data records in the ledger ; | - Sequence: The sequence of records in a ledger cannot be changed | May be difficult to assure precise chronological order of records entered into different ledger providers. However, chronological order within ledger maintained. |
| (d) they record data in such a way that any subsequent change to the data is immediately detectable, ensuring their integrity over time. | Immutably: The content of the ledger cannot be changedIntegrity: Any change to an individual record once placed in the ledger can be detected.Persistent: The above properties are not time-limited | PDL meets eIDAS 2 requirements |

Generally, eIDAS 2 requirements are in common for the basic immutability and integrity of PDL. However, the requirements for supporting the multi-party properties of PDL need to be added to those of eIDAS 2.

In terms of electronic records management, EU requirements for qualified electronic ledgers are under legal certainty for those that ensure the uniqueness, authenticity and correct sequencing of the records entry in a tamper proof manner. From the point of view of the PDL and its governance it fulfils the essential for suitable multiparty co-operations, the main challenge is for those more decentralized or multi-jurisdictional governance models with which the cross-border protection may require additional auditing and reporting mechanisms, although digital single market like the pan-European legal framework recognises trust services for the recording of data which are able to be qualified by providing legal certainty for its use cases and accountability.

### 6.2.2 Governance & Audit

**Governance requirements**

|  |  |  |
| --- | --- | --- |
| **eIDAS 2 requirements** | **ISO /TS 23635:2022 principles** | **Assessment** |
| EU Trusted lists | Principle 1: Define identifiers of entities involved | The trusted list identifies whether a QTSP provides qualified electronic ledgers. But it does not identify the PDL community (or communities) for which the QTSP provides services. |
|  | Principle 2: Enable decentralized decision-making | Decentralised decisions not addressed by eIDAS 2 |
| Article 46b: eIDAS 2 supervision  | Principle 3: Ensure explicit accountability | Provides accountability under eIDAS 2 requirements, but not against PDL governance requirements. |
| Article 46b: audit requirements | Principle 4: Support transparency and openness | eIDAS 2 depends on accredited auditor. The details of the audit are generally not available to all stakeholders. |
| Article 3 (16) trust service’ means an electronic service normally provided for remuneration | Principle 5: Align incentive mechanisms with system objectives | eIDAS 2 trust services are generally incentivised through remuneration. |
|  | Principle 6: Provide performance and scalability | Performance and scalability not addressed by eIDAS 2 |
| Compliance required with:* NIS 2 cybersecurity
* GDPR
 | Principle 7: Make risk-based decisions and address compliance obligationsPrinciple 8: Ensure security and privacy | Risk management and cyber security are essential to NIS2.GDPR requires privacy  |
| Interoperability is a requirement for both digital identities and electronic signatures and seals | Principle 9: Consider interoperability requirements | Common concern of eIDAS 2 and PDL. |

In general eIDAS 2 governance requirements provides a foundation for the governance of a PDL However, there are aspects of PDL which are outside the scope of eIDAS 2 relating to the multi-party nature of PDL and governance of a community of ledger providers that support PDL.

Thus, the governance of a PDL based on eIDAS 2 should be addressed as two layers:

1. Basic governance requirements of a Qualified Electronic Ledger Provider following the regulatory requirements of eIDAS 2.
2. Additional requirements for governance of a community of Qualified Electronic Ledger Providers.

The second PDL specific governance layer would address:

* Application: The applicability of the PDL in terms of usage and community.
* Consensus: The protocol mechanisms used to achieve consensus between PDL node provider.
* Synchronisation: The protocol mechanisms used to ensure that ledgers are synchronised over time.
* PDL Community identification: The mechanisms used for identification and authentication of electronic ledger providers that are members of a particular community.
* Additional policy requirements: The requirements on the procedures and practices of electronic ledger providers based on eIDAS 2 requirements.
* User requirements: Requirement on the PDL user for providing data to be placed in a ledger.
* Audit: Requirements on the audit of PDL node provider.
* Permissioned: Rules for acceptance under PDL governance regime.

### 6.2.3 Policy and Security Requirements

In line with 2 layer approach described above policy and security requirements specifications:

Layer 1: policy and security requirements on individual ledger providers in line with the requirements of eIDAS 2.

Layer 2: policy and security requirements on for governance of a PDL community operating under the same governance.

### 6.2.4 Trusted Management

[Text to be added on use of trusted list and mechanisms for identifying members of a specific PDL.]

## 6.3 PDL in Support of eIDAS 2 Trust Services

### 6.3.1 PDL in support of Time Stamping

A TSP issuing time-stamps may register the time-stamp (as specified in ETSI EN 319 422) in a distributed ledger. This provides added assurance of:

* The existence of a timestamp within the sequential chronological ordering of events:
* the persistence of the time-stamps over extended periods.

### 6.3.2 PDL in support of Signature Validation

A TSP providing signature validation may register the validation report (as specified in ETSI TS 119 102-2) in a distributed ledger. This provides added assurance of:

* the validation of the signature within the sequential chronological ordering of events
* the persistence of the validation reports over extended periods.

### 6.3.3 PDL in support of Certificate Issuance and Revocation

A TSP issuing certificates and managing their revocation status may register the certificate issuance and revocation report (as specified in ETSI EN 319 411-1) in a distributed ledger. This provides added assurance of:

* the status of a certificate within the sequential chronological ordering of events
* the persistence of the certificate issuance and revocation reports over extended periods.

### 6.3.4 PDL in support of Electronic Attestation of Attributes Services

A TSP supporting electronic attestation of attributes may register the issuance and change of status (as to be specified under work item DTS 019 472-1) in a distributed ledger. This provides added assurance of:

* reports on the issuance and status change of a of an electronic attestation of attributes within the sequential chronological ordering of events
* the persistence of reports on issuance and status change of an electronic attestation of attributes over extended periods.

### 6.3.5 PDL in support of Electronic Archive Services

A TSP supporting electronic archive services may register the existence of an archived data in a distributed ledger. This provides added assurance of:

* the existence of an archived data within the sequential chronological ordering of events
* the persistence of archived data over extended periods.

### 6.3.6 PDL in support of Electronic Registered Delivery Services

A TSP supporting electronic registered e-delivery service, including its derivative register electronic mail, may register the proofs (as specified in EN 319 522 parts 1 to 4) in a distributed ledger. This provides added assurance of:

* existence of registered electronic delivery proofs within the sequential chronological ordering of events.
* the persistence of proofs over extended periods.

## 6.4 Application to 3rd (non-EU) countries

[https://ec.europa.eu/digital-building-blocks/wikis/display/DIGITAL/Pilot+for+the+International+Compatibility+of+Trust+Services](https://ec.europa.eu/digital-building-blocks/wikis/display/DIGITAL/Pilot%2Bfor%2Bthe%2BInternational%2BCompatibility%2Bof%2BTrust%2BServices)

eIDAS contemplates an internationalization area with which third (non-EU) countries are able to be subject under eiDAS 2 regulation in art.14“ it establishes that "trust services provided by trust service providers established in a third country shall be recognised as legally equivalent to qualified trust services provided by qualified trust service providers established in the Union where the trust services originating from the third country are recognised under an agreement concluded between the Union and the third country in question or an international organisation in accordance with Article 218 TFEU".

This internationalization aspects reflects the possibility once a Mutual Recognition Agreement is countersigned in this purpose. Hence a LOTL (List of Trusted Lists) whereby 3rd country trusted list may result of mutual recognition.

There are four pillars for the assessment check-list which are described in ETSI TR 103 648 for 3rd countries to perform a self-assessment on how compliance achieve those minimal legal requirements:

* Legal context
* - supervision and auditing
* -best practice
* - trust representation

<https://www.etsi.org/newsroom/news/1701-2020-02-etsi-releases-a-technical-report-on-global-acceptance-of-eu-trust-services>

# 7 General Conclusions

## 7.1 Benefits

- Application of established eIDAS 2 trust controls to governance of ldegers.

- Immutable history of timed events (e.g. validity update of certificates, signatures, attributes)

- The immutability of records persists of extended time periods

- Distributed trust through consensus mechanisms

## 7.2 Challenges and Risks

- Privacy

- The sequencing of events is not guaranteed for events that occur within the time needed to establish consensus across the distributed nodes of a PDL.

## 7.3 Recommendations

An EU wide Qualified PDL may be used in support of s qualified trust services, such as those supporting qualified electronic signatures and seals, to enhance the chronological sequencing and persistence of the QTSP provided objects which assure the validity of signatures and seals.

# 9. Bibliography

PDL published specifications to be added.

Annex A:
Title of annex

Annex :
Change History

| Date | Version | Information about changes |
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