***Disclaimer***

The present document has been produced and approved by the <long ISGname> (<short ISGname>) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG.  
It does not necessarily represent the views of the entire ETSI membership.

ETSI GS PDL - v0.0.1(2019-11)

**Group Report**

Smart Contracts in Telco Permissioned Distributed Ledgers — System Architecture and Functional Specification

Reference

DGR/PDL-004

Keywords

blockchain, Smart Contracts, Policy, Service Level Agreement (SLA)

***ETSI***

650 Route des Lucioles

F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C

Association à but non lucratif enregistrée à la

Sous-préfecture de Grasse (06) N° 7803/88

***Important notice***

The present document can be downloaded from:  
[http://www.etsi.org/standards-search](http://www.etsi.org/standards-search#Pre-defined Collections)

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at <https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:  
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

***Copyright Notification***

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2019.

All rights reserved.

**DECT**TM, **PLUGTESTS**TM, **UMTS**TM and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.  
**3GPP**TM and **LTE**TM are trademarks of ETSI registered for the benefit of its Members and  
of the 3GPP Organizational Partners.  
**oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and  
of the oneM2M Partners  
**GSM**® and the GSM logo are trademarks registered and owned by the GSM Association.

Contents

Intellectual Property Rights 3

Foreword 4

Modal verbs terminology 4

Executive summary 4

Introduction 4

1 Scope 4

2 References 5

2.1 Normative references 5

2.2 Informative references 5

3 Definition of terms, symbols and abbreviations 5

3.1 Terms 5

3.2 Symbols 5

3.3 Abbreviations 5

4 Smart Contracts 6

4.1 Definition 6

4.2 Properties 6

4.3 Components 6

5 Smart Contracts – Planning, coding and Testing 6

5.1 Planning phase 6

5.2 Coding Phase 6

5.3 Testing Phase 6

6 Architectural requirements for Smart Contracts 6

6.1 Reference Architecture 6

6.2 Interaction between PDLs 6

7 Smart Contracts – Applications, solutions and Needs 6

7.1 Regulatory Aspects 6

8 Limitations of Smart Contracts 7

8.1 Inter and Intra system threats 7

8.2 Limitations 7

Annex B: Title of annex 7

B.1 First clause of the annex 7

B.1.1 First subdivided clause of the annex 7

Annex <L>: Authors & contributors 7

Annex <L+1>: Bibliography *(style H9)* 8

# 

# Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server ([https://ipr.etsi.org](https://ipr.etsi.org/)).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

# Foreword

*[ETSI Drafting Rules](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx)* [(](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx)*[EDRs)](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx),*

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

The present document is part <i> of a multi-part deliverable. Full details of the entire series can be found in part [x] [Bookmark reference].

# Modal verbs terminology

*[ETSI Drafting Rules](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx)* [(](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx)*[EDRs)](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx),*

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](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

# Executive summary

This present document specifies a high-level functional abstraction of PDL Smart Contract System Architecture. In particular, basic building blocks for designing, coding and testing Smart Contracts for the PDLs. This includes describing how different classes of systems interact with Smart Contracts. Processes, models, and detailed information are beyond the scope of the present document.

# Introduction

The present document defines a high-level functional abstraction of policies to design and code Smart Contract components. Smart Contracts are mere codes, and if not well planned, designed, coded and tested; can leave the system vulnerable to external attacks and internal errors.

# 1 Scope

**Scope of work to be undertaken:** The present document specifies the functional components of Smart Contracts, their planning, coding and testing. This includes:

a) reference architecture of the technology enabling Smart Contracts – the planning, designing and programming frameworks

b) specify how to engage using this architecture – the methods and frameworks the Smart Contracts building blocks possibly communicate

c) point out possible threats and limitations

# 2 References

## 2.1 Normative references

## 2.2 Informative references

# 3 Definition of terms, symbols and abbreviations

## 3.1 Terms

## 3.2 Symbols

## 3.3 Abbreviations

AML: Anti-Money Laundering

API: Application Program Interface

SC: Smart Contract

CEN-CENELEC: European Committee for Standardization and European Committee for Electrotechnical Standardization.

DLT. Distributed Ledger Technology

EBP: European Blockchain Partnership

EBSI: European Blockchain Service Infrastructure.

EC: European Commission

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

FIG: International Federation of Surveyors

GDPR: General Data Protection Regulation

ICO: Initial Coin Offering

ICT: Information and Communications Technology

ISO: International Standards Organization

ITU: International Telecommunication Unit

KYC: Know Your Customer

OECD: Organization for Economic Co-operation and Development

PDL: Permissioned Distributed Ledger.

SG: Study Group.

SLA: Service Level Agreement

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.

# 4 Smart Contracts

## 4.1 Definition

## 4.2 Properties

## 4.3 Components

# 5 Smart Contracts – Planning, coding and Testing

## 5.1 Planning phase

## 5.2 Coding Phase

## 5.3 Testing Phase

# 6 Architectural requirements for Smart Contracts

## 6.1 Reference Architecture

## 6.2 Interaction between PDLs

# 7 Smart Contracts – Applications, solutions and Needs

## 7.1 Regulatory Aspects

# 8 Limitations of Smart Contracts

## 8.1 Inter and Intra system threats

## 8.2 Limitations

Annex B:  
Title of annex

# B.1 First clause of the annex

## B.1.1 First subdivided clause of the annex

<Text>.

<PAGE BREAK>

Annex <L>:  
Authors & contributors

The following people have contributed to the present document:

**Rapporteur**:  
Title, Firstname, Lastname, company

**Other contributors**:Title, Firstname, Lastname, company

<PAGE BREAK>

Annex <L+1>:  
Bibliography *(style H9)*

The "Bibliography" annex identifies additional reading material not mentioned anywhere in an ETSI deliverable including annexes. These publications might or might not be publicly available (no check is made by the Secretariat).

The Bibliography **shall include** list of standards, books, articles, or other sources on a particular subject which are not cited anywhere in an ETSI deliverable including annexes.

The Bibliography **shall not include** *documents listed in clauses 2.1 and 2.2.*

*[ETSI Drafting Rules](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx)* [(](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx)*[EDRs)](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx),* clause 2.14.

* Use **Heading 9** style for the "Bibliography" annex, see clause 2.13 of the [EDRs](https://portal.etsi.org/Services/editHelp!/Howtostart/ETSIDraftingRules.aspx) for examples.
* For the listed material use the **Normal** style or bulleted lists (e.g. **B1+**), do not use numbered references.

*EXAMPLE 1:*

*<*Publication*>*:"*<*Title*>".<*Edition*>*. *<*Year*>*, *<*Issue designation*>*, *<*Page location*>*. *(style Normal)*

WEAVER, William. "Command performances". December 1985, vol. 42, n° 12, p. 126-133). *(style Normal)*

*EXAMPLE 2:*

* <Publication>: "<Title>". *(style B1+)*
* ETSI EN 300 066: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Float-free maritime satellite Emergency Position Indicating Radio Beacons (EPIRBs) operating in the 406,0 MHz to 406,1 MHz frequency band; Technical characteristics and methods of measurement". *(style B1+)*

<PAGE BREAK>