



The Standards People



Permissioned Distributed Ledgers

Smart Contracts and IoT

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For: **ICT Verticals and Horizontals for Blockchain Standardisation**

Agenda

- ❖ Introduction to ETSI ISG PDL(Permissioned Distributed Ledgers)
- ❖ Smart contracts: An introduction
- ❖ Smart contracts and IoTs
- ❖ Smart contract standardisation ISG PDL



ISG - PDL

The ISG PDL Goals and Scope

- ❖ Provide the foundations for the operation of permissioned distributed ledgers
 - ❖ Create an open ecosystem of industrial solutions
 - ❖ Deployable by different sectors
- ❖ Foster the application of the technology
 - ❖ Start from already available experiences
 - ❖ Coordinate with existing initiatives
- ❖ Define a set of well-known open operational mechanisms
 - ❖ Support their demonstration
 - ❖ Facilitate interoperability assessment
- ❖ More than thirty members from industry (telco and not telco), public sector and academia

The Work Programme (I)

- ❖ PDL-001 - Landscape of Standards and Technologies
 - ❖ Identify relevant activities in standardization and research.
- ❖ PDL-002 - Applicability and Compliance to Data Processing Requirements
 - ❖ Analyse the essential data processing requirements
- ❖ PDL-003 – Application Scenarios
 - ❖ Potential application scenarios for the operation of PDLs and governance aspects
- ❖ PDL-004 – Smart Contracts PDL System Architecture and Functional Specification
 - ❖ Planning, designing and programming frameworks
- ❖ PDL-005 – PoC Framework
 - ❖ Build commercial awareness and confidence and encourage development of an open ecosystem

The Work Programme (II)

- ❖ PDL-006 – Inter-Ledger Interoperability
 - ❖ Key elements for the exchange and use of the information available across DLs
- ❖ PDL-007 – Research Landscape
 - ❖ Facilitate exchange of information on PDL related research projects
- ❖ PDL-008 – PDL Research and Innovation Landscape
 - ❖ Document research and innovation projects relevant for BDLT standardisation
- ❖ PDL-009 – PDL for federated Data Management
 - ❖ Architecture and key functional mechanisms leveraging PDL for federated data management
- ❖ PDL-010 – PDL Operations in Offline Mode
 - ❖ Challenges related to data storage and ledger operations when the PDL nodes are offline



Smart contracts

Smart Contracts: An Introduction

Software codes installed on Permissioned Distributed Ledgers (PDLs)

PDLs : Distributed Immutable data structures where all the participants keep a copy of the ledger

Properties

- ❖ Immutable
 - ❖ Once recorded cannot be changed or amended
- ❖ Auto-executable
 - ❖ Triggered by software condition
- ❖ Transparent
 - ❖ Because they are installed on PDLs – all the participants of the ledger keep the same copy

Smart contracts and IoT

Key Requirements for the future IoTs

- ❖ Service Availability (ex: Connected car)
- ❖ Service Reliability (ex: Remote surgery)
- ❖ Not all IoTs need super-fast connection (ex: electricity meters)



Service Level Agreement (SLA) guarantee

Accountability

Flexibility of service contract

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How smart contracts can facilitate IoTs' SLAs?

Transparency



Trustworthy service agreement record-keeping

Self-execution



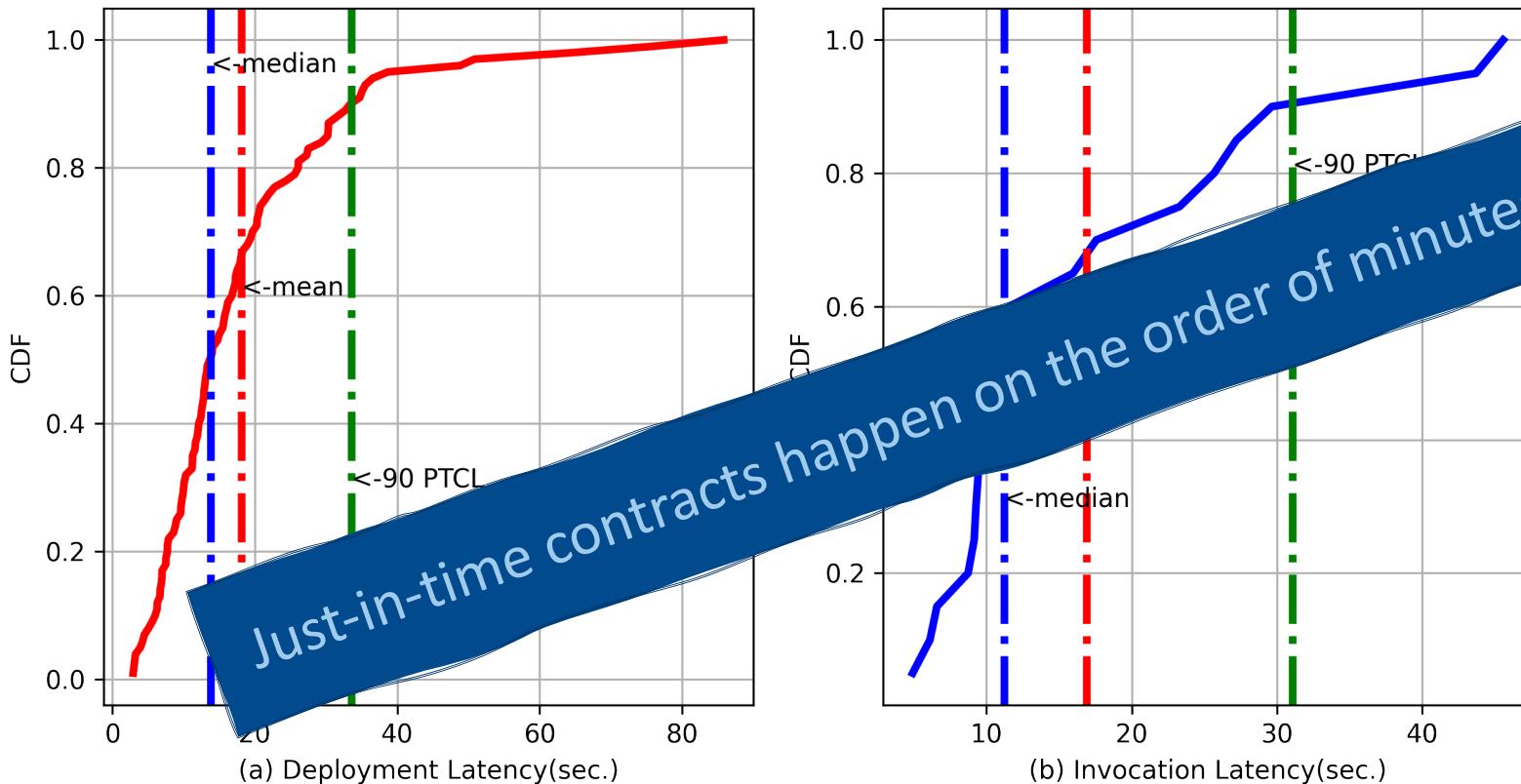
Automated payments and settlement of SLA infringements

Immutability



No service agreement tampering possible

Can we adopt smart contracts for service contracts?



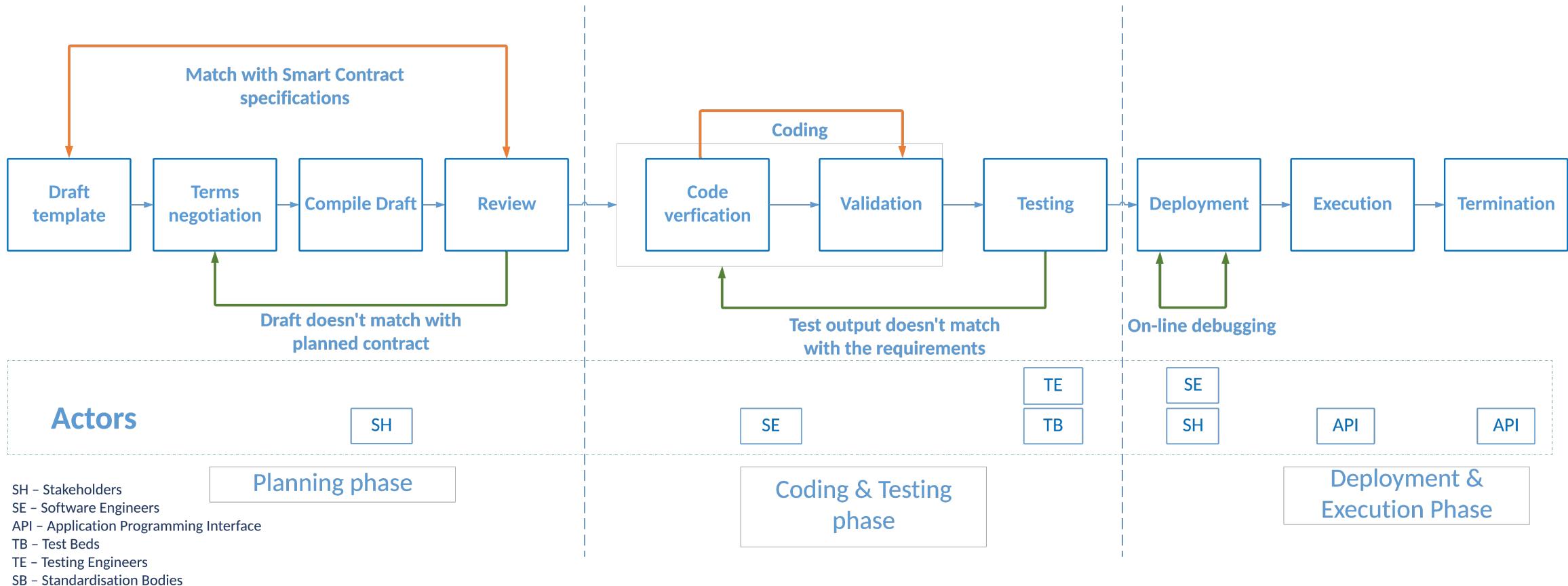
Mean Deployment ~18s.
Mean invocation ~16s.

Resource reservation may take order of minutes.

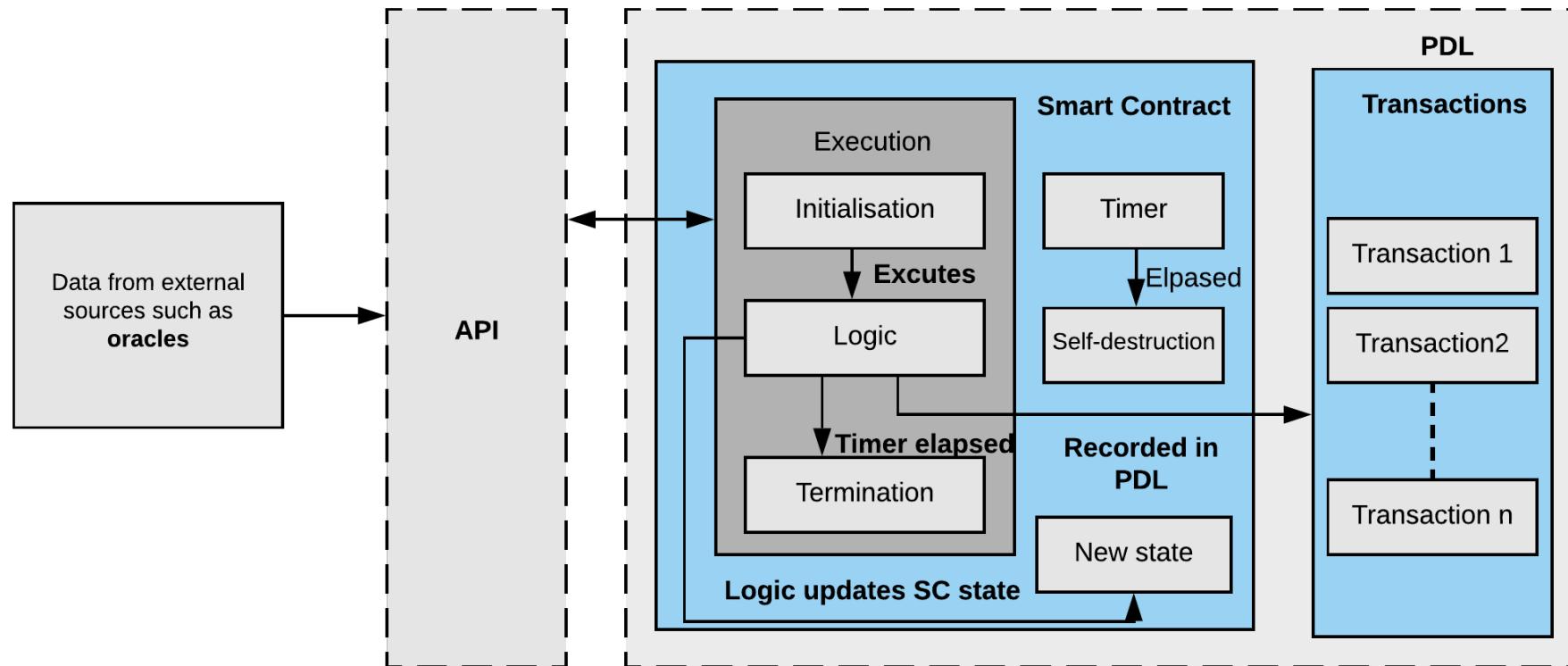


ISG – PDL - Smart Contract Standardisation

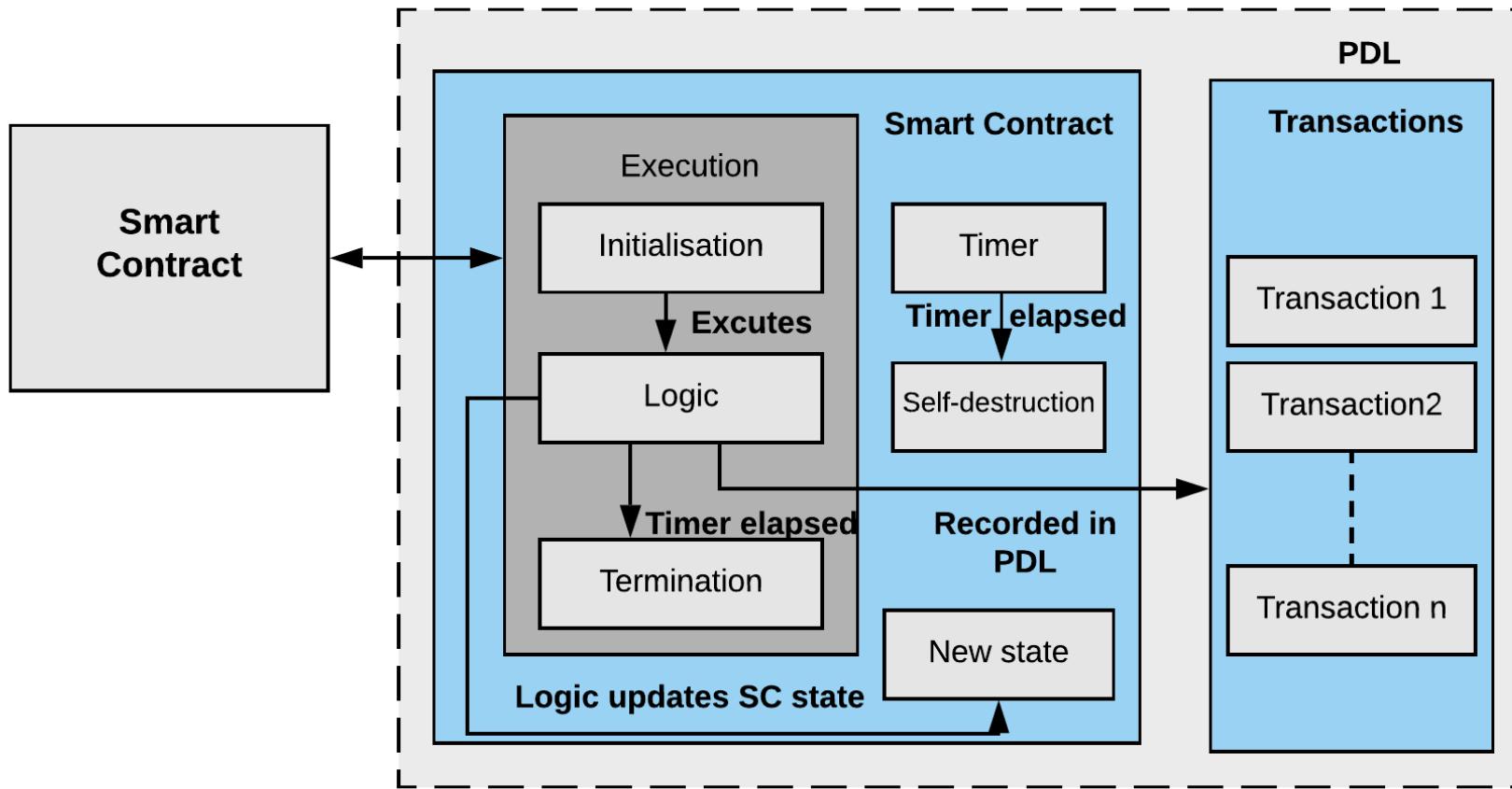
Smart contract life-cycle



Smart Contract Reference Architecture



Smart Contract Reference Architecture (Contract Chaining)





Conclusion

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Smart contract standardisation is important because:

- ❖ Future applications of IoT need flexibility, service level guarantee and accountability
- ❖ Smart contracts are a potential solution for future accountable, transparent and autonomous contracting mechanism
- ❖ They provide a method to create traceable audit mechanism

For Further Reference

❖ ETSI ISG PDL

- ❖ PDL Terms of Reference, ETSI ISG PDL Portal : <https://portal.etsi.org/TB-SiteMap/PDL>
- ❖ Work Programme: <https://portal.etsi.org/tb.aspx?tbid=873&SubTB=873#lt-50611-work-programme>
- ❖ PDL Community: <https://portal.etsi.org/TB-SiteMap/PDL>List-of-PDL-Members-and-Participants>

❖ PDL Proofs of Concept (PoCs)

- ❖ PDL Wiki and PoC Proposal How-To: <https://pdlwiki.etsi.org/>

❖ Research and Standardisation

- ❖ Research Projects interested in collaborating with PDL refer to: [PDL Work Programme](#),
[PDL Membership List](#), [PDL Member Agreement/PDL Participant Agreement](#)
- ❖ ETSI Research and Standards Website, ETSI Research Strategy,
ETSI Tools for Researchers, FAQs on Research and Innovation: <https://www.etsi.org/research>