ETSI The Standards People

Permissioned Distributed Ledgers

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Introduction

Blockchain Industrial Applicability

- Need to go beyond the unconstrained environments that built the distributed ledger case
  - Manageability
  - Scalability (number of nodes, TPS)
  - Time and energy efficiency
  - Fairness
  - Legal implications
- A permissioned approach
  - Seeking for multi-sector environments
  - Telco and beyond
- Most, if not all, industrial implementations are one-headed solutions (dependent on a single vendor)
  - As many other *cloud services*
  - With some advantages, but not real **distributed** governance (AKA “DAO”)
  - Defeats the purpose of disintermediation

An Industrial Focus

- Challenges when trying to apply (permissioned) distributed ledger solutions among different entities
  - Accountability
  - Performance predictability
  - Specific sector regulations
  - The need for *carrier grade service* (or their equivalent)
  - Service level implies going beyond functioning code into support, release cycle, automation of governance, testing and certification.
- The infrastructure must be operable and scalable before being marketable
  - Governance has multiple flavors
  - Autonomous governance (AKA “DAO”) must be based on solid agreed specifications
  - Identity and security are key factors

Open and Well-Established Operational Mechanisms

- Validate participant nodes
- Reach consensus among the participant nodes
- Publish and execute operations related to the recorded transactions
- Facilitate the automation of node management and operation
- Communicate events relative to node operation
- Define ledger data-flows for different scenarios
- Verify the execution of smart contracts
- Establish trusted links among different ledgers using the above mechanisms

Focus: Data Conduits and Flows

- Define data processing requirements (trust, throughput, security) of IRPs based on ref. architecture
  - Effective conformity assessment
  - Identity/Access control
  - Last-Mile
  - An open environment for tracking industrial certified IoT and Edge devices
- Distributed and federated data management
  - Data collection and sharing
  - Federated learning
  - Privacy and sovereignty in data pipelines
- Non-repudiation mechanisms
  - Non-repudiation types and objects
  - Technologies and strategies

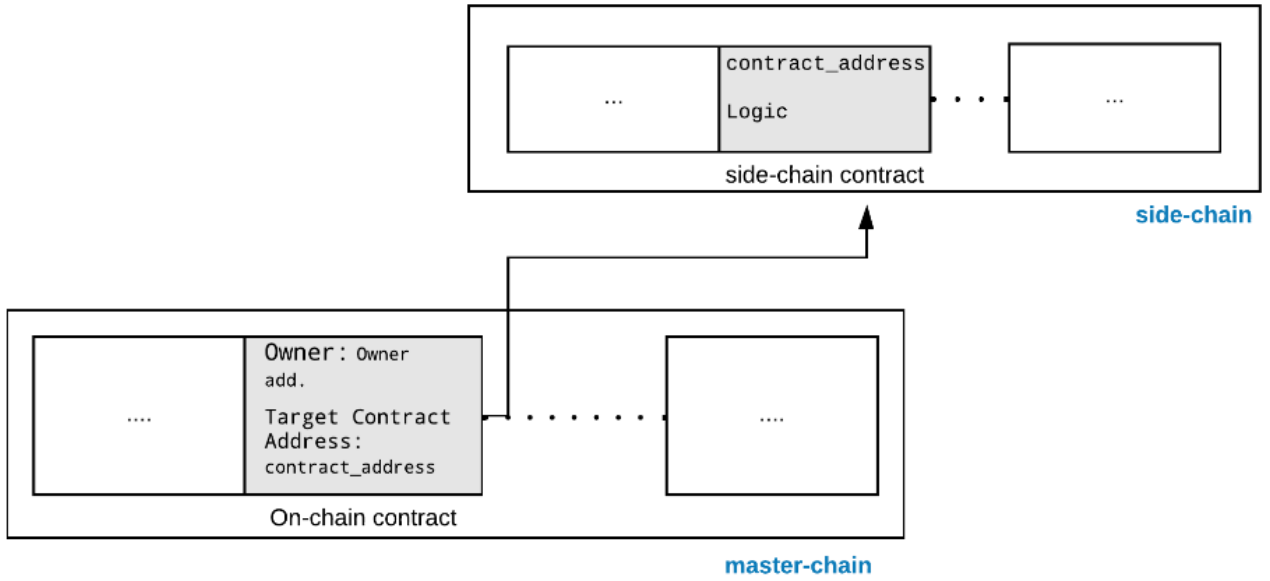
Focus: Smart Contracts

- Inherent immutability, auto-execution and transparency
  - Well-known and open methods for verification
  - Well-established governance practices
  - Well-defined data conduits and triggers
  - Redactability
  - Inter-Ledger operability (ledger agnosticism)
- A Proposal for an EN on smart contracts
  - Joint work between ETSI (TC ESI) and CEN/CENELEC
  - Using PDL work as foundation

Smart contracts: Data is editabled, Side Chains

Side-chain deployment In this method, the main logic of a contract is stored in a side-chain and only some indication of that contract is stored in the master-chain. The advantage of this technique is that, since it is not required for a full-contract code to be in the master-chain, this is scalable.

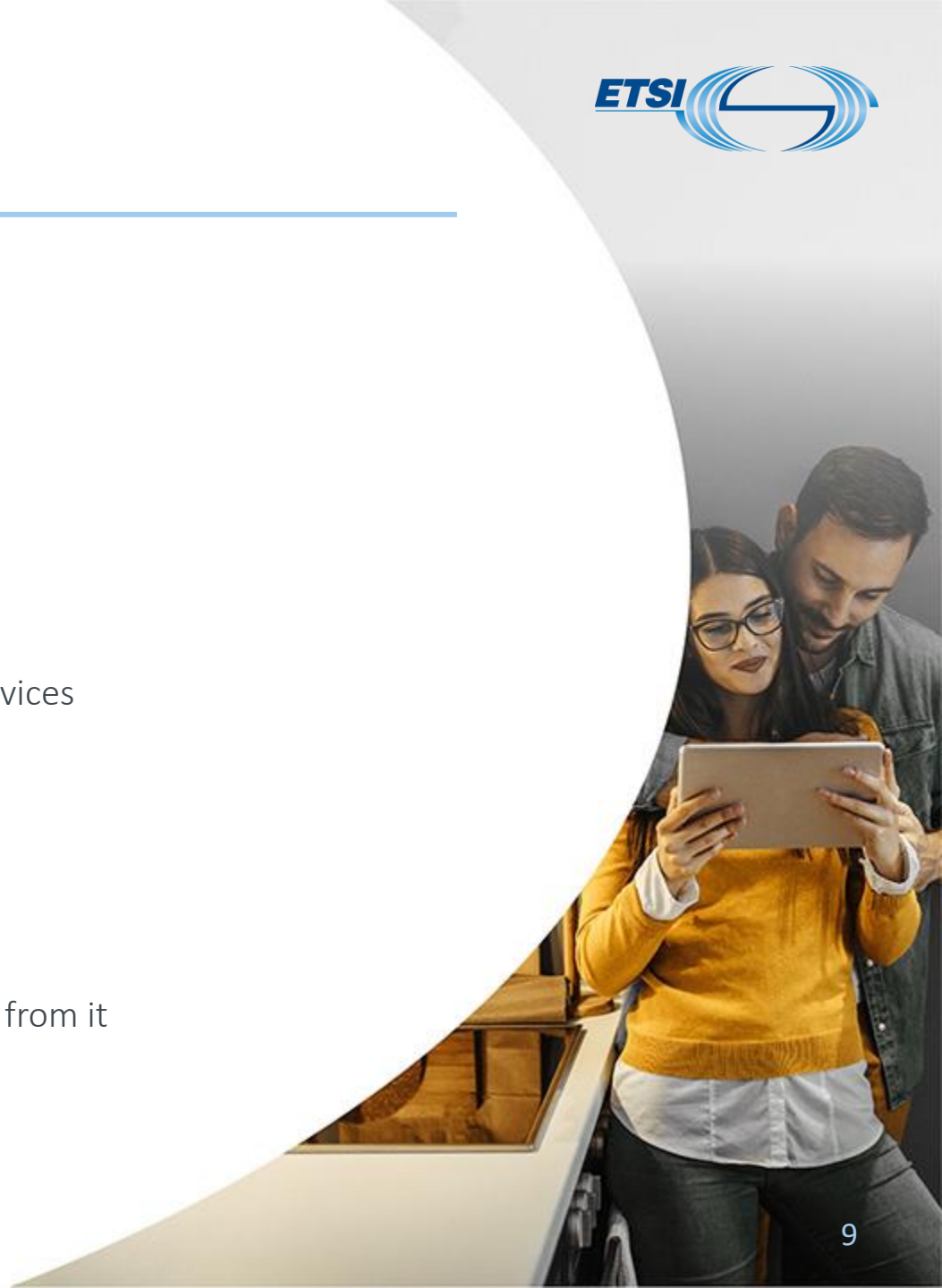
It can stay forever and can be callable by other contracts, also as it is in the chain, it occupies storage. Side-chain Smart Contracts can be reused by other users of the PDL (delegated by the owner of the contract).



PDL 004 v1.1.1 Figure 5-1 Master-chain and side-chain Smart Contracts

Focus: Application Scenarios

- Operational aspects
  - Provision models, with special emphasis on as-a-service paradigms
  - PDL infrastructure governance aspects
- Identity and trust management
  - Decentralized identifiers (DID) and trust service management
  - Controlled transparency to share trust data with service providers
  - Support integration with APIs related to public and private identidy services
- eIDAS applicability
  - As qualified electronic ledgers
- Reputation management
  - Ways to define reputation and its uses
  - Methods to determine score and derive commercial/operational value from it
  - Detecting fallacies and ensuring GDPR compliance



Focus: DAO (Digital Autonomous Organization)

Application for transparent and autonomous governance in next-generation ICT

- Interoperability
- Standardized specifications
- Testing and Certification
- Providing traceable audit mechanisms
- Assessment of the impact of ledger characteristics: consensus protocol, APIs…
- The necessary alignment of ancillary elements

Blockchain-based, self coordinated and self governed, with decentralized governance, mediated by a set of self-executing rules deployed on a public blockchain.

Published and In-Progress Reports and Specifications

- PDL-001 - Landscape of Standards and Technologies
- PDL-002 - Applicability and Compliance to Data Processing Requirements
- PDL-003 - Application Scenarios
- PDL-004 - Smart Contracts PDL System Architecture and Functional Specification
- PDL-005 - Proof of Concepts Framework
- PDL-006 - Inter-Ledger interoperability
- PDL-008 - Research and Innovation Landscape
- PDL-009 - Federated Data Management
- PDL-010 - Operations in Offline Mode
- PDL-011 - Specification of Requirements for Smart Contracts' architecture and security
- PDL-012 - Reference Architecture
- PDL-013 - Supporting Distributed Data Management
- PDL-014 - Study on non-repudiation techniques
- PDL-015 - Reputation Management
- PDL-017 – eIDAS (Early draft)
- PDL-018 - Redactable Distributed Ledgers
- PDL-019 - PDL Services for Identity and Trust Management
- PDL-020 - Wireless Consensus Network (GR)
- PDL-021 - 3GPP use cases
- PDL-022 – PDL in Supply Chain management (Nearly ISG approved draft)
- PDL-023 – DID Framework (Neary Stable Draft)
- PDL-024 – Architecture for SP (Draft)
- PDL-025 – Wireless Consensus GS (Draft)
- PDL-026 – Settlement of usage-based services (early draft)
- PDL-027 – SSI in Telecom Networks (early draft)
- PDL-028 – Study on Utilizing PDL to Standardized IoT Service Layer Platform oneM2M(early draft)

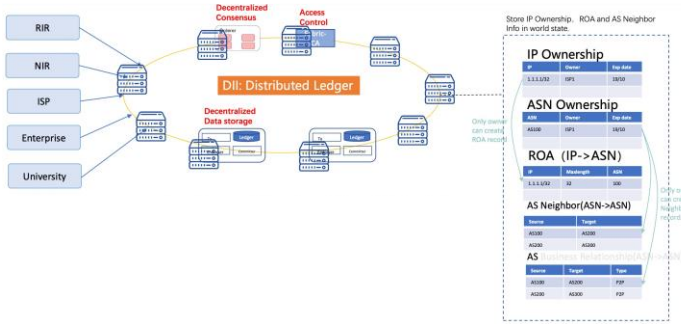
The PDL PoC Framework

- Build awareness and confidence and encourage development of an open ecosystem
  - Demonstrative, Informative and Normative deliverables.
- Look for practical results
  - Explore technology options
  - Facilitate gap analysis
  - Contribute to guide future ISG activity
- Lightweight process
  - Few (objective) requirements to file a PoC proposal
  - Run PoC project
  - Openly report results to the community
- A key tool for collaboration with research and industrial initiatives

PoCs Executed so Far

PoC001: Blockchain for Inter-Domain Security

- Avoid prefix hijacks, path hijacks and route leaks
- Proof on IP and ASN ownership and AS adjacencies
- BGP Update messages validated against the ledger

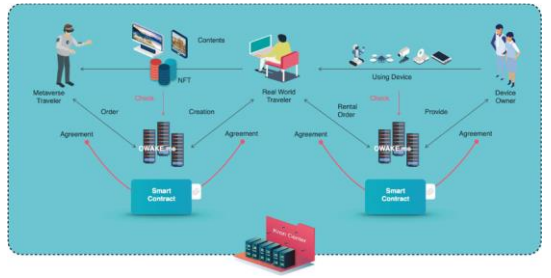


PoC002: Secure Marketplace for Access to Ubiquitous Goods

- Smart contracts support for a neutral, verifiable and auditable marketplace
- Multiple distributed ledgers and inter-ledger operations
- Integration of SOFIE project components

PoC003: Timeless in Metaverse Environment Based on Edge Networks

- Individuals exchange contents based on smart contracts
- NFT content transfer among edge nodes via P2P mechanisms
- Support for a data economy in a Metaverse environment



As Conclusion: The ISG PDL raison d'être

- Address gaps in the complex landscape of DLT/Blockchain
  - Challenging as it is
  - Avoid the temptation of reinventing wheels (or levers)
- Essential concepts
  - Permissioned distributed ledgers
  - Operational aspects, focused on minimal requirements and best practices
  - Commercial and Operational added value
  - Matching physical assets within the digital world
  - Smart contracts, data processing, and identity features as main applications
- Intended for any service (not limited to telco or network services)
  - PDL-as-a-service
  - PDL as a network service
  - PDL as a network service enabler

For Further Reference

- ETSI ISG PDL: https://www.etsi.org/technologies/permissioned-distributed-ledgers
  - 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