
**Blockchain and distributed ledger
technologies – Use cases**

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ISO/TR 3242:2022

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 307, *Blockchain and distributed ledger technologies*.

www.iso.org/iso/foreword.html

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides a selection of use cases to illustrate a spectrum of applications of distributed ledger technologies including the blockchain (hereafter referred to as DLT). The use cases reflect various international domains, business and industry sectors and processes.

The use cases help to identify actual and potential applications of the technology in the given context, along with relevant requirements, options, benefits, and risk mitigation strategies.

The framework of this document enables this approach by providing a perspective of use cases that goes beyond the traditional vertical sectors or DLT attributes. This document provides assessment across five different categories to provide technology, market and social perspectives. The visualisation of user flows and architecture enables a broader perspective of the role of a DLT as part of on-ledger and off ledger ecosystems. By assessing current DLT implementations, these use cases provide learnings that apply to governance, compliance, interoperability, cross-border regulations, and scalability.

The open innovation approach to use cases can contribute to accelerating the implementation of these new technologies and help reduce the instance of duplication or repeated solution development. This bridge of new information and existing standards can also inform innovators and SMEs to adopt a standards-based approach to build the future of DLT, especially where new decentralised business models apply for example in areas such as financial technology (fintech) and the energy sector.

This document is arranged in three sections for easy reference and comparison.

[Clauses 4, 5, and 6](#) describe the approach, process and criteria of use case selection and study. This provides a guide to the template structure and five key categories that draw out the impact of DLT attributes across transversal (related technologies), horizontal (attributes), vertical (sector specific), United Nations Sustainable development goals (SDGs) and status (from pilot to implementation stages). The use cases each have a set of visualizations that provide further detail of DLT activity as well as the relationship to the user and technology ecosystem. The diagrams include data flow models, a reference architecture from a single node view, and behavioural UML. As such, the template and diagrams provide a detailed insight into the individual use case.

[Clause 7](#) provides commentary on the trends identified in the use case. This provides analysis of categories and DLT types in the use cases. Examples include the clusters of DLT the adoption of hybrid or new DLT and the use of open source^[1].

[Clauses 8, 9, 10, and 11](#) provide the detailed use cases reflecting the digital marketplace, arranging them in the template format for easy comparison. The combination of categories and commentary in this document is designed to help readers reference the relevant classification to their sector as well as discover transferable attributes from other categories that can be applied to their DLT requirements.

The work on this document started with identifying the key themes which have the most DLT activity and inviting use cases in these sectors. This resulted in a first set of sector clusters including Fintech, Supply Chains, Data Provenance and Energy.

Blockchain and distributed ledger technologies – Use cases

1 Scope

This document lists use cases that summarise common capabilities and usage patterns for attributes of distributed ledger technologies including the blockchain in order to help standards and technology development. This document includes use cases reflecting a range of industry sectors, processes and specific applications.

This document can inform decision-makers considering or involved in applying these new technologies, including business, academia, government, technical and standards bodies.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22739, *Blockchain and distributed ledger technologies — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22739 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

hybrid

both a private (e.g. consortium) blockchain for internal business use and a public blockchain to publish information of public interest (e.g. certification attainment)

4 Use case processes

The use case collection methodology was broad-ranging. A global call for use case contributions was made. Use case authors submitted use cases to a use case repository and from that collection, the set of use cases contained in this document was selected.

A blockchain/DLT use case template was created to ensure conformance and facilitate comparison across use case application domains and contexts. The use case template applied here includes descriptive text and visualisation formats and applies a System View representation of the Blockchain and DLT Reference Architecture specified in ISO 23257^[3].

Given the application domain of blockchain and DLT use cases, where business and enterprise aspects including tokenisation and autonomous governance can be facilitated on-chain, it is considered important that use case descriptions elaborate both business and technical information.

In this way the document provides a comparative analysis of 22 international use cases to better communicate:

- transferable blockchain attributes across vertical and horizontal domains

- infrastructures that support emerging decentralised business models
- detailed views of on-chain and off-chain DLT data flows

Figure 1 outlines this use case preparation workflow.

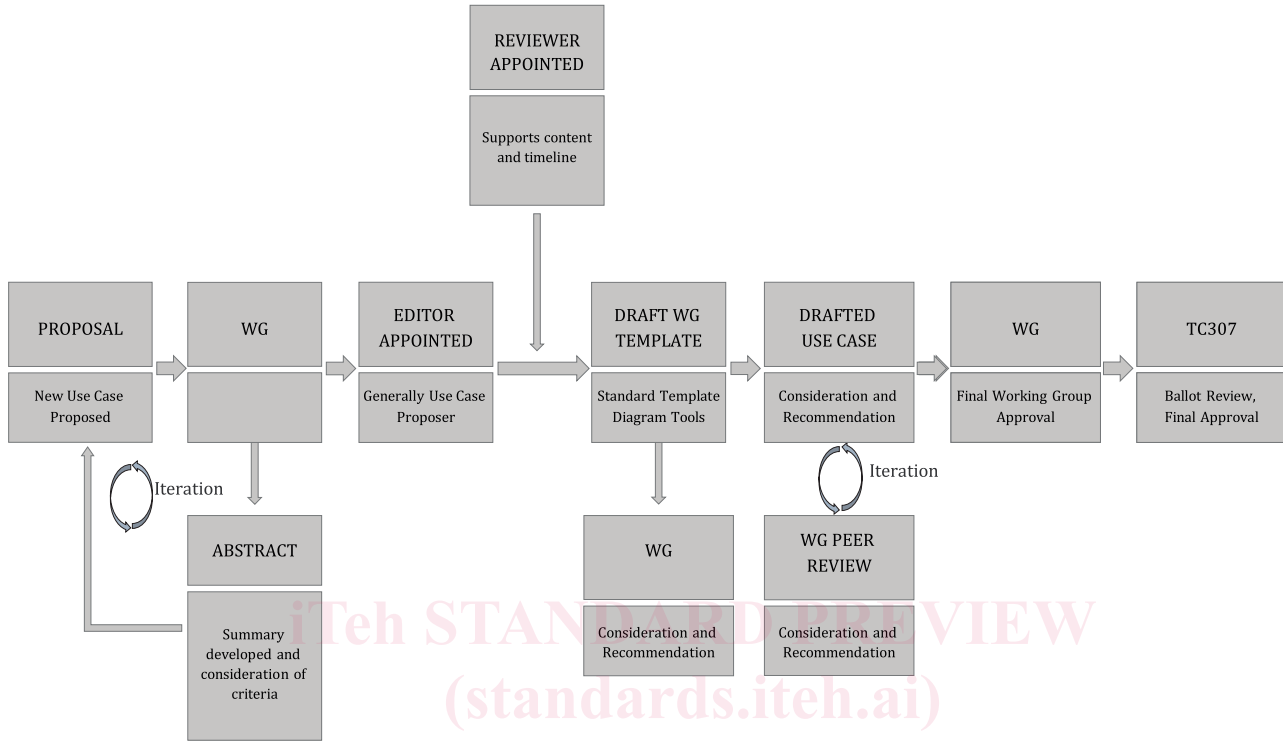


Figure 1 — Use case process and review flow

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5 Template development

5.1 General

To provide a standard criterion for analysis, a comprehensive template was created that draws together attributes of each use case in a way that enables comparison and review. The template includes five sections that explore the distinct roles of blockchain/DLT in each use case:

- Title
- Categories
- Summary
- User Requirements
 - Functional Requirements
 - Visualizations
 - Reference Architecture
 - Data Flow Model
 - Behavioural UML
- Force Field Analysis^[4]

5.2 Functional Requirements

The use case functions are visualised through a series of diagrams that include user models, data flows and system architecture.

There is also reference to smart contracts, security, identity and privacy management, open-source software and non-functional requirements.

5.3 System architecture

This is a Lab Project which analyses the system architecture to identify stakeholder interaction and data flows using a reference architecture described in [Figure 2](#) that describes a DLT network application from the perspective of Node A connected to a blockchain network. This architecture derives from the modular Reference Architecture System View described in ISO 23257^[3] and has been applied to all the use cases in this document. Common kinds of interfaces including external interfaces and intersystem interfaces are included as well as the APIs including both user and admin ones.

The functional components of the system architecture are grouped and outlined as follows:

- **DLT Nodes**
- **Application systems:** for administration and for users, providing end-user capabilities and capabilities for administration and management of the DLT system respectively. Use case authors specify the functional models for both systems to illustrate the services enabled by the solution.
- **Non-DLT systems:** off-chain code, the DLT oracles, the non-DLT applications and off-ledger data are presented and specified based on the actual use case situation.
- **Other DLT systems:** include the separate DLT systems that interoperate with the DLT system.
- **Multi-layer functions:** one or more of the multi-layer function components could be included as per use case actual situation, such as development, the management and operations, security and governance and compliance.

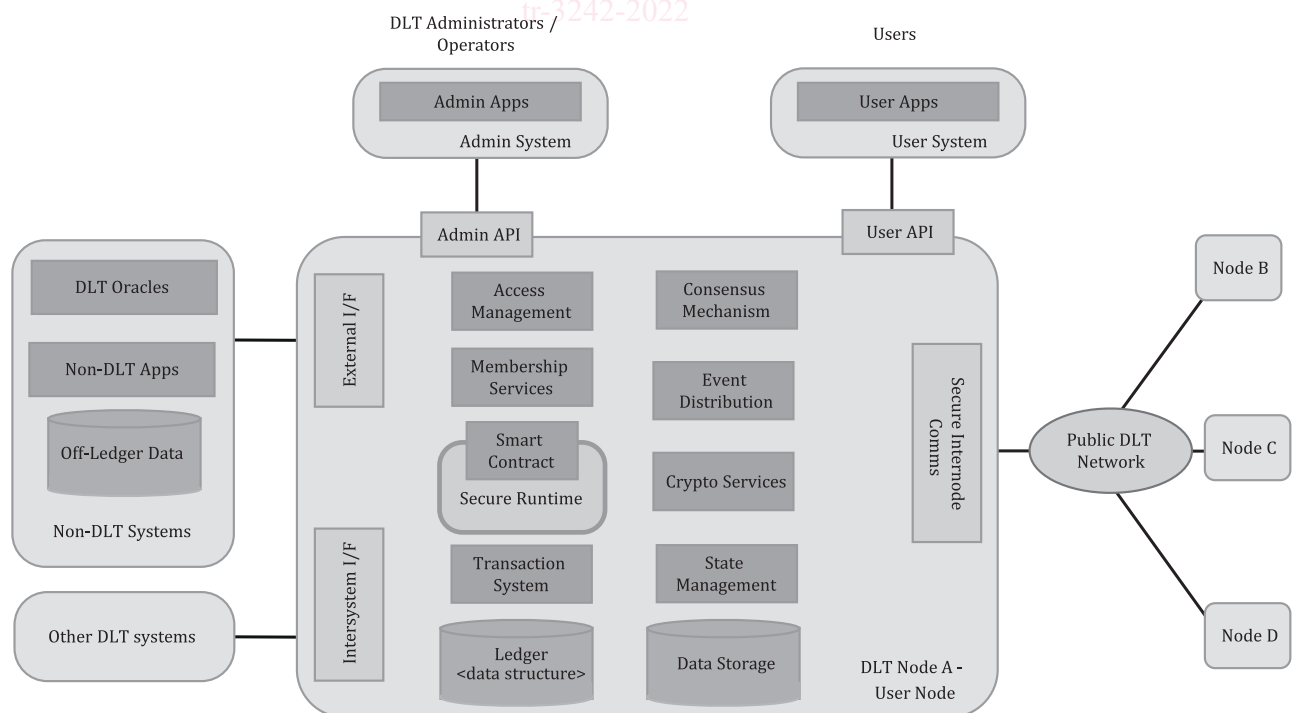


Figure 2 — Reference Architecture System View (ISO 23257 ^[3])

5.4 Data Flows

DLT Stakeholder roles:

The purpose of the DLT data flow diagram is to identify which data flows are triggered by the data-related operations of stakeholders, between system components that belong to or are associated with them.

DLT data can usefully be classified according to its source as shown in [Figures 3](#) and [4](#). The sources identified here align with the six DLT roles (ISO 23257^[3]) identified as DLT administrators, users, providers, developers, governors and auditors. Among these, administrators, users and providers are the most relevant roles to use case definition. Stakeholders achieve their aims by means of role-based interactions with the DLT system.

NOTE The treatment of off-ledger data is similar to that of other information technology systems. However, a ledger is immutable, which makes identifying transparency and privacy objectives important.

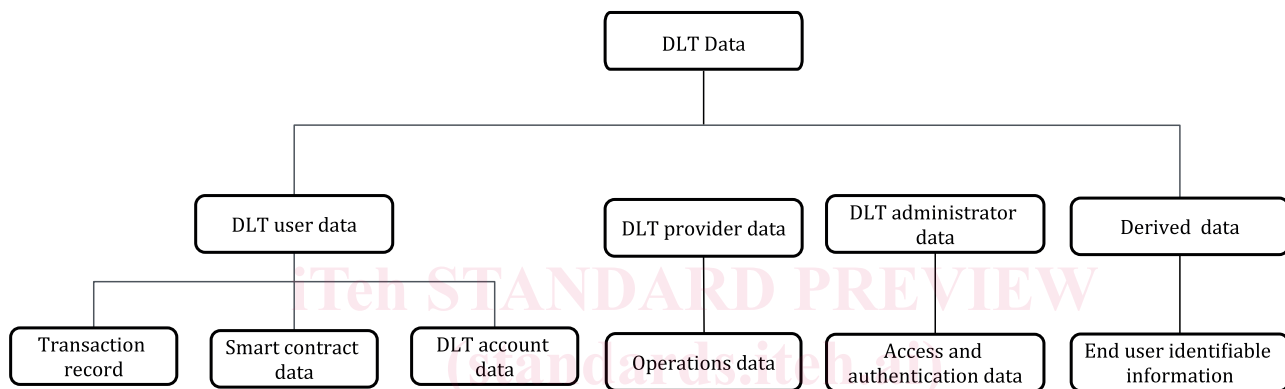


Figure 3 — Data categories from the data source perspective

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System data flows:

The purpose of this data flow analysis diagram is to demonstrate a system-wide data flow, and identify which data flows are triggered by the data-related operations of which stakeholders.

- a) Specify the role of each stakeholder in facilitating the data flow.
- b) Identify the type of data flow (See categories A to D and Z below)
- c) Identify the data location: on- or off-ledger.

There are five fundamental DLT data flows. (See [Figure 4](#)) Categories A to D are important for understanding a use case.

A: between 2 separate DLT systems when they interoperate.

B: between a DLT system and non-DLT systems connected to it.

C: between administration applications and a DLT system.

D: between user applications and a DLT system.

Z: within and between the nodes of the DLT system.

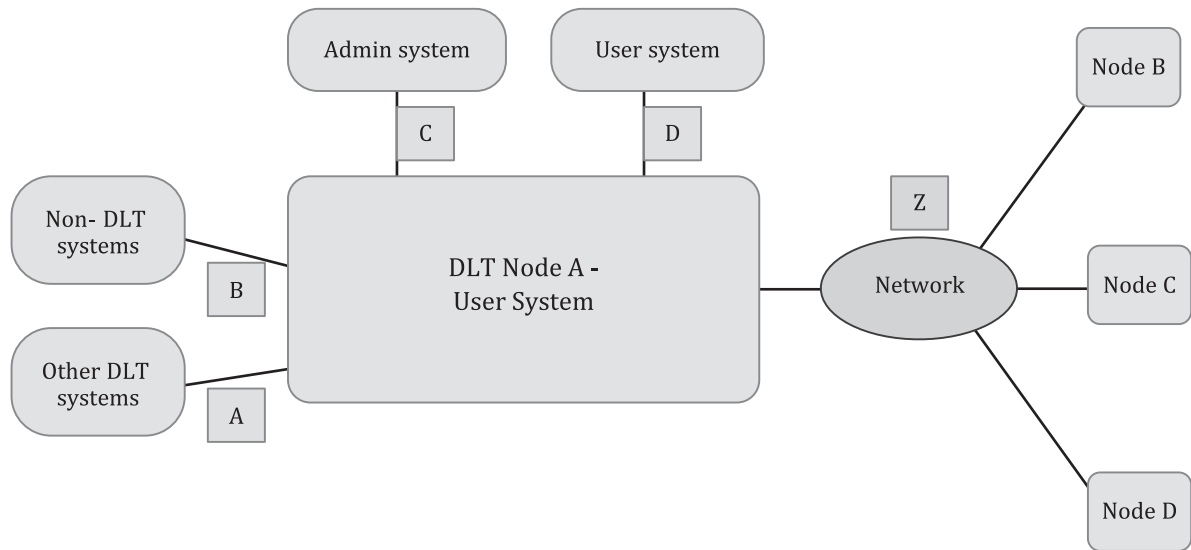


Figure 4 — DLT Data Flow diagram

5.5 Use Case Models

The purpose of a Universal Modelling Language (UML) behavioural model is to illustrate user and system interactions, as shown in Figures 5 and 6, and to provide greater detail about user aims and actions in the system and how these are achieved.

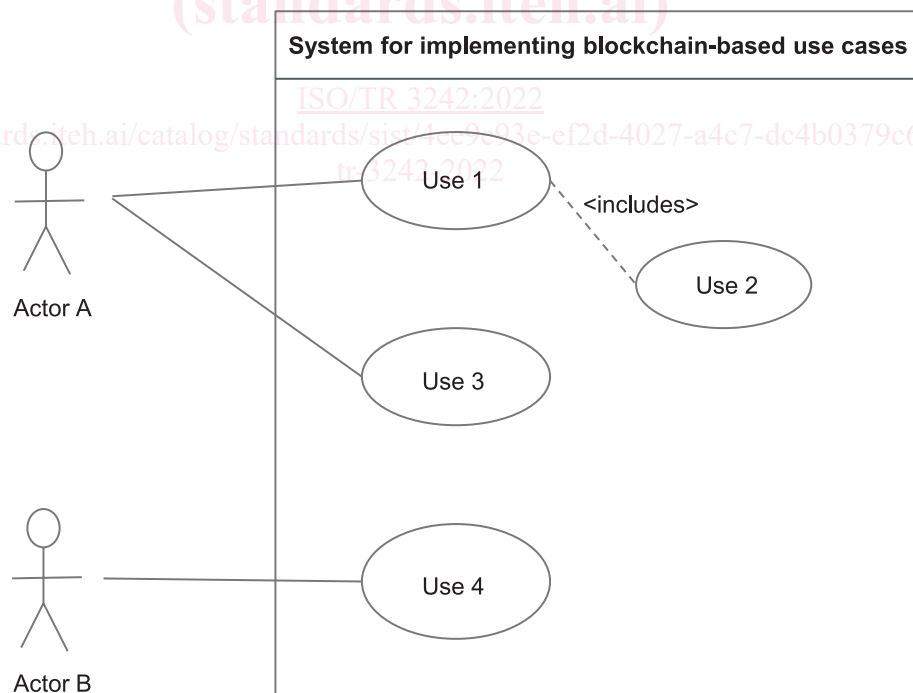


Figure 5 — Simple use case diagram

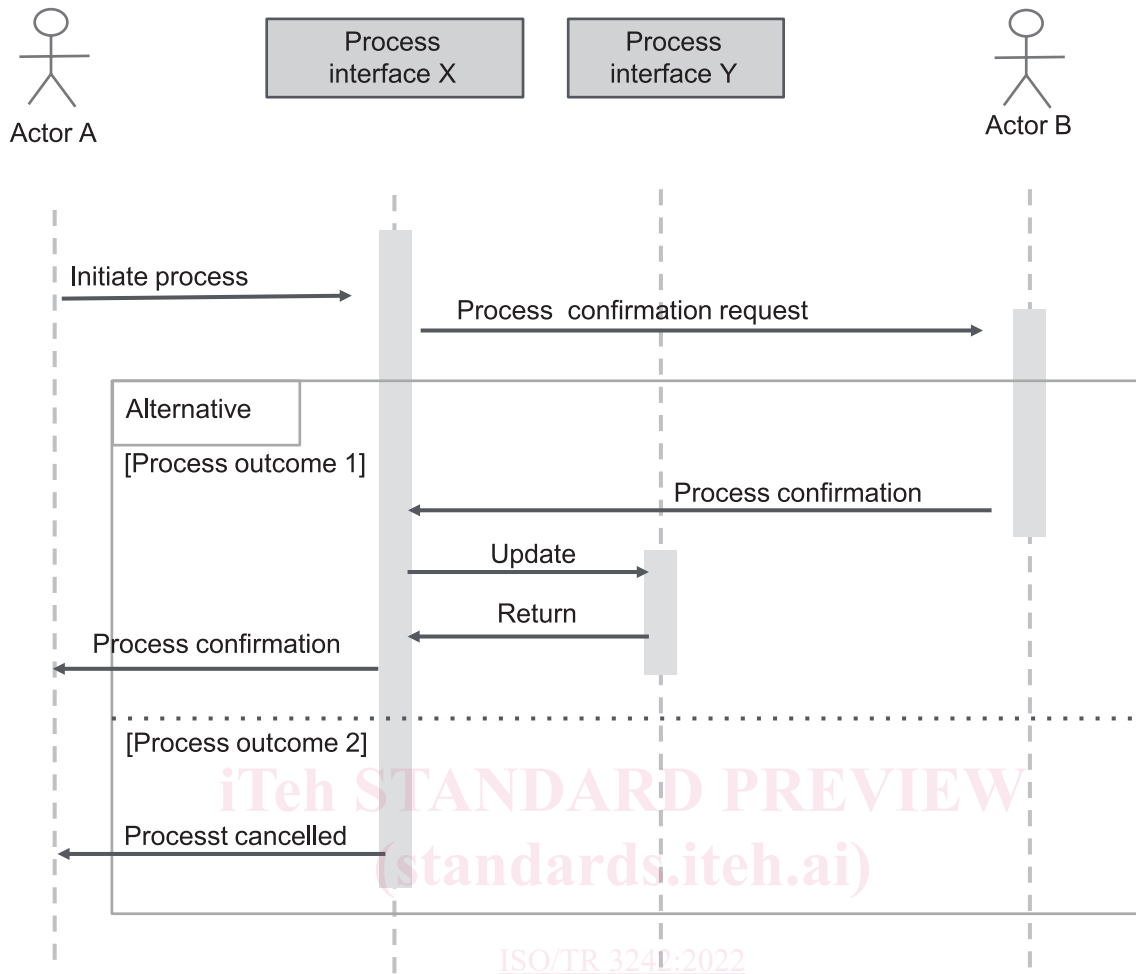


Figure 6 — Example sequence diagram

5.6 Categories

To provide a standard criterion for analysis, a comprehensive template methodology was created that includes five categories of applications. These categories are selected so that this document can usefully be referenced and incorporated into other research, analysis and standardization. These are:

- Transversal (related technologies).
- Horizontal (attributes).
- Vertical (sector specific).
- United Nations Sustainable development goals (SDGs).
- Status (classified across a spectrum of technical development phases).

This document includes commentary of the use cases and insights into these categories in [Clause 7](#). An example of the use case template is in [Annex A](#).

5.7 Category: Transversal

The transversal category considers related technologies and is derived from the EU Information and Communications Technology (ICT) Standardisation Rolling Plan^[5].

This category reflects the 'Key enablers and security' section of the EU ICT Rolling Plan which includes:

- a) Cloud computing.
- b) Public sector information and open data.
- c) Internet of Things.
- d) Cybersecurity / network and information security.
- e) Electronic identification, trust services, e-signatures.
- f) e-Privacy.
- g) e-Infrastructures for research.
- h) Accessibility of ICT products and services.
- i) Artificial Intelligence.
- j) 5G.
- k) Broadband infrastructure mapping

5.8 Category: Horizontal

The horizontal category reflects cross-sector applications and attributes from a market-based, business analysis approach and uses terms commonly used in the current DLT ecosystem.

This category derives from consideration of ISO/TS 23258^[6] leading to insights in taxonomic and ontological descriptions. Both are deemed valid approaches and by referencing both approaches it is understood that valuable insights into the DLT ecosystem as a whole are gained.

- a) Identity Management
 - Rights and Identity Management, Identification.
- b) Data Provenance
 - Disintermediation in Production, Actions Traceability
- c) Governance
 - Collaboration, Decision Making, Structuration
- d) Cryptocurrency and asset exchange
 - Electronic Payment, Cryptocurrency and Token Exchange
- e) Process Optimisation
 - Intellectual Property Protection, Certification.
- f) Automation
 - Contract Management, Automation.

This document includes commentary and insights into these categories in [Clause 7](#).

5.9 Category: Vertical

The purpose of the vertical classification in the use case template is to facilitate discovery and research of economic activity by end-users of this document. For this reason, the UN ISIC economic activity classification system is chosen whereby: