I-DELTA

Interoperable Distributed Ledger Technology

Deliverable 5.6

Use-case Interoperability Test Results

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Abstract:	**I-DELTA is a distributed ledger technology (DLT) platform designed to promote interoperability among different DLTs without the need for structural changes. The solution allows for transferability of data elements from one DLT platform to another while maintaining their uniqueness and state consistency. This document provides an overview of the implementation of I-DELTA through several interconnected use cases, including digitalization of smart power grids, energy traceability, digitalization of legal agenda, and loyalty program. The use cases aim to promote the adoption of green energy, encourage civic participation, and foster more sustainable and engaged communities. The document also describes the integration of I-DELTA with other applications, such as I-Benefit and Canada.**
Keywords:	**Distributed Ledger Technologies, Interoperability, Green Energy, Civic Participation, Sustainability, Verifiable Credentials, IoT, AI, ERP, Digitalization, Loyalty**

Table of Content

1. Executive Summary

IDELTA aims to enable different Distributed Ledger Technologies (DLTs) to interoperate with one another seamlessly, without the need for structural changes. Furthermore, the solution allows for data elements to be transferable from one DLT platform to another while maintaining their uniqueness and state consistency with confidence.

To achieve this goal, the interconnected use cases within the Idelta scenario collaborate to promote the adoption of green energy, encourage civic participation, and foster the development of more sustainable and engaged communities. By harnessing the unique benefits of DLTs, these systems provide transparent, secure, and efficient solutions to address pressing environmental and societal challenges.

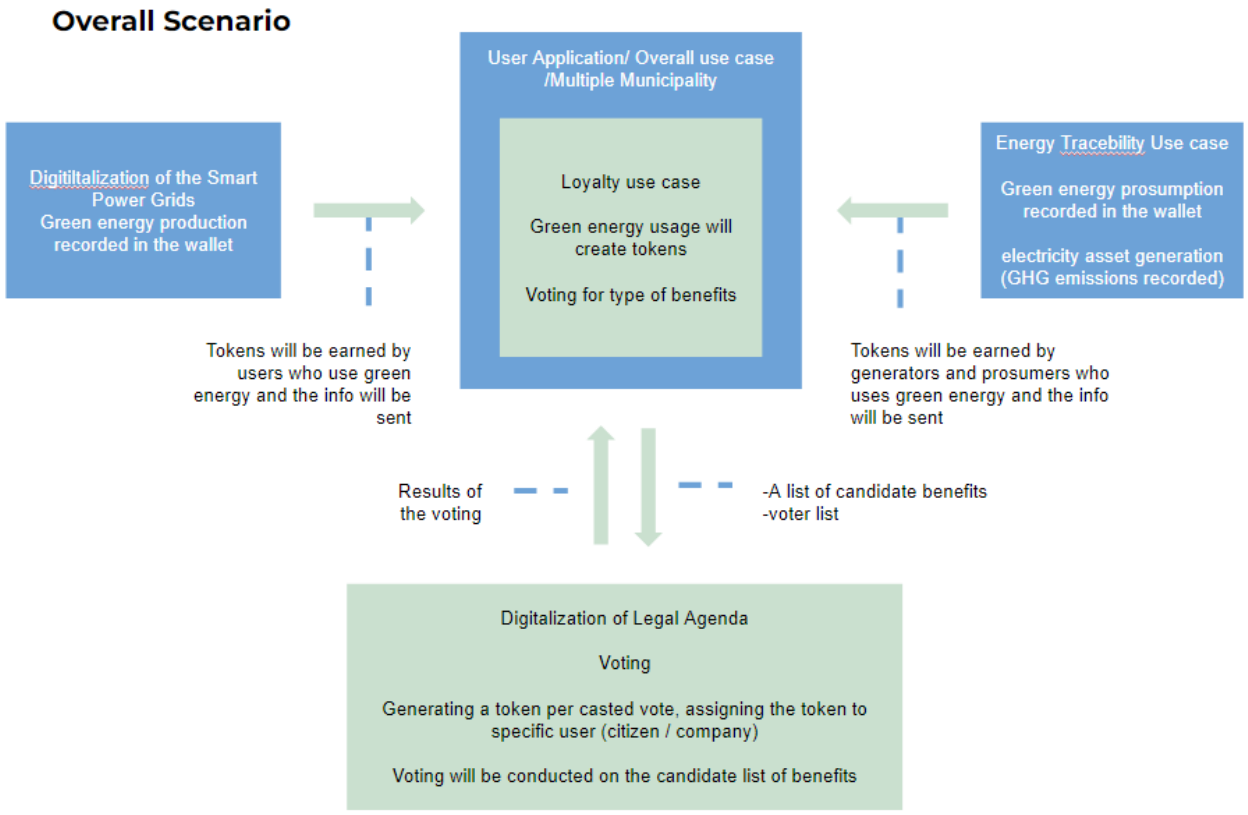
Through the implementation of Idelta, various DLT platforms can effectively communicate and exchange information, streamlining cross-platform processes and ensuring data integrity. This level of interoperability not only strengthens the overall performance of the individual DLT systems but also fosters collaboration and innovation across different sectors and industries. By bridging the gap between diverse DLT platforms, Idelta plays a crucial role in driving the widespread adoption and success of these cutting-edge technologies.

2. Project Description

Distributed Ledger Technologies (DLT) undoubtedly are a cutting-edge new breed of technologies with the potential to completely transform the way our society works. DLT will foster switching from the “Internet of information" era to the “Internet of Value" era, whereby decentralized and immutable contracts define business interactions and secure exchanges of information. I-DELTA aims to create an interoperable DLT-based platform enhanced by AI, integrating with existing IT systems such as ERP and IoT applications.

3. Implementation

3.1. Overall Scenario



The Digitalization of Smart Power Grids use case focuses on integrating distributed energy resources, such as solar panels and wind turbines, into the power grid. By leveraging DLTs, this use case allows for secure, transparent, and efficient tracking of energy production and consumption. Additionally, it encourages users to actively participate in the energy market by generating and consuming green energy, ultimately contributing to a more sustainable future.

The Energy Traceability Use Case aims to provide a transparent and accurate record of the origin and type of energy consumed by users. Through DLTs, this use case ensures that consumers have reliable information about the energy they use, allowing them to make informed decisions and promote the adoption of clean energy sources. Furthermore, energy producers can demonstrate their commitment to sustainability by showcasing their green energy production efforts.

The Digitalization of Legal Agenda use case employs DLTs to create a secure and transparent platform for managing the voting process. This system ensures the integrity of elections, preventing fraud and manipulation, while also increasing voter turnout by simplifying the voting process. By rewarding voters with tokens, this use case further encourages citizens to actively participate in the democratic process, fostering a more inclusive and engaged community.

In the overall scenario, the Loyalty Use Case establishes a reward system that encourages users to engage in sustainable practices, such as consuming green energy and participating in the democratic process. Users can accumulate tokens by taking part in these actions and redeem them for various services within their municipality, such as discounts on public transportation, access to cultural events, and other local benefits. This system motivates users to adopt eco-friendly behaviors and strengthens civic engagement.

In summary, these interconnected use cases within the Idelta scenario work together to promote the adoption of green energy, foster civic participation, and create more sustainable and engaged communities. By leveraging the unique benefits of DLTs, these systems offer transparent, secure, and efficient solutions to address pressing environmental and societal challenges.

4. I-Benefit

4.1 I-Benefit and Loyalty Integration

The initial idea behind I-Benefit was to expand the usage areas of the Loyalty application. However, with the additional features we have added, I-Benefit has become a standalone application rather than a mere byproduct of the Loyalty application. The shopping feature in I-Benefit, the ability to access the application with a credential without requiring membership, the ability to scan offline bus, plane, concert, cinema tickets with a QR code, and the credentials necessary to obtain IDLT tokens on Ethereum, Avax, and Polygon test networks, which we have created, are obtained from the Loyalty application. Users are required to use the Loyalty application for this PoC.

In order to utilize the features available in our system, users must purchase credentials using the money in their Loyalty application account from the Benefit purchase section. For instance, if a user wants to obtain a credential for the Tarkan concert in the Loyalty application, they must purchase it there. After the purchase, through our integration, the credential is assigned to the user's account in I-Benefit. To prevent any inconvenience for the user, credentials purchased from the Loyalty application cannot be rejected in I-Benefit. However, after transferring the credential to their wallet, the user can delete it if they wish.

If I need to explain the technical details of the integration, we have created endpoints from our system to be used in the Loyalty application. If the user purchases a benefit from the Loyalty application and does not have an account in I-Benefit, a new account is created with the username and password being the same as the Loyalty application's username. If the user has an account but no connection to I-Delta Agent, we intervene in the user's wallet and establish the connection. This is only valid for the PoC. The decision to establish the connection should be up to the user, but we added this feature to ensure that the transactions do not fail. After purchasing a benefit in the Loyalty application, I-Benefit's endpoints are called. The Loyalty application sends the information to the I-Delta Agent, which was created for Loyalty application transactions, within the credential. Due to the schema structure, this information is predefined. The Loyalty application cannot send any additional information. The benefit information that can be sent from the Loyalty application is as follows: BenefitID, BenefitCode, BenefitName, BenefitDescription, OwnerLei, BenefitCompany, BenefitDate, and if the user has purchased tokens, the BenefitValue information along with the username of the user who performs the transaction is sent from Loyalty to I-Delta Agent. First, I-Delta Agent checks the established connections by the username to find the ID of the connection. Then, it matches the attributes with the attributes defined in the schema. After arranging the Connection ID, Schema ID, Credential Definition ID, and Attributes, it issues the credential to the user. Since each benefit has a different endpoint, there is no need to search for the Schema ID and Credential Definition ID.

4.2 I-Benefit and Canada Integration

Our integration with Canada is aimed at transferring verifiable credentials created in Canada to I-Benefit. Since we do not use the same technology to create verifiable credentials, we cannot transfer them directly. Canada has provided an endpoint that shares credentials from their system. Since the structure of the credential is fixed, we created a schema with the attributes used by Canadians through I-Delta Agent. After arranging the Canadian credentials according to this schema, we can issue them to any desired user. However, we preferred to create a user account in I-Benefit with the name of the companies in the Canadian data and issue the credential to this account. Hyperledger Aries did not allow us to create the DID received from

Canada directly in our system, so we kept it as an attribute in the credential. While I-Benefit uses did:sov as the DID method for the wallets we create, Canada uses did:key method. However, users can review both the DID details of the credential in I-Benefit and the DID information from Canada added as an attribute through the button on our interface.