



I-DELTA

Interoperable Distributed Ledger Technology

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Reports generated by Report System

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Abstract:	<p>I-DELTA is a Distributed Ledger Technologies (DLT) based platform that enables seamless interoperability between different DLTs while ensuring data consistency and uniqueness. The platform promotes green energy adoption, civic participation, and sustainable communities. I-Benefit is a DLT-based wallet application for verifiable credentials that uses Zero-Knowledge Proofs to verify predicates. This report system generates usage reports, tracks credential generation, usage, and website-based activities, and monitors system performance. The system records six credential schemas that can be converted to gift tokens, used for authentication, age verification, tax deductions, and energy wallet integration. The report system improves user experience by optimising frequently used parts and provides feedback to users during peak hours. The I-Delta agent is the most used agent due to system integration.</p>
Keywords:	<p>Distributed Ledger Technologies, interoperability, verifiable credentials, Zero-Knowledge Proofs, usage reports, credential generation, system performance, credential schemas, gift tokens, authentication, age verification, tax deductions, energy wallet integration, I-Delta agent, system integration, ERP, IoT, Internet of Value.</p>

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1. Executive Summary

I-DELTA 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 I-DELTA 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 I-DELTA, 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, I-DELTA 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. Reports Generated by Report System

3.1. I-Benefit (Türkiye - Dakik Yazılım)

I-Benefit is a DLT-based wallet application for verifiable credentials developed using Hyperledger Aries and Hyperledger Indy. It supports many features and benefit types such as authentication tokens, identity verification documents, tickets, gift cards etc. all using verifiable credentials generated for decentralized identifiers. Thanks to the Zero-Knowledge Proofs, the predicates on the information stored in these credentials can be verified without revealing the exact information.

3.1.1. Analytical Report

In I-Benefit, we have developed a reporting system that used the stored activities of the users and the response performance of the system. Thanks to this reporting system, we can easily generate usage reports, find and optimize the slow parts of the system, and keep track of set KPIs. Also, tracking users' activities shows us where we should focus in the future.

3.1.1.1. Credential Generation Analysis

Keeping track of the Credentials allows us to prevent possible bugs and to find out where the user got an error in case of these bugs. Our reporting system stores which agent issued the credential to the user when the user accepted it, and for what purpose the credential was issued, together with the timestamps.

Currently, our system has 6 credential schemas. As the usage areas of the credentials increase, this number of schemas may also increase. The Benefit credential can be converted into shopping and gift tokens, the Brutflix credential can be used for authentication, and the Ticket credential can be verified offline using a QR code, which can be obtained from the Loyalty application. Users can obtain the Identity Card credential, which is necessary for verifying their age with Zero Knowledge Proof for PG-rated content in the Brutflix application, through I-Benefit. The Canada credential, which we created for the Energy Wallet integration, can be obtained from the Energy Wallet application. The Bill credential, which is assigned by HepsiOrada after shopping and can be used for tax deductions, is also available. These credential schemas are created by the agent and recorded on the ledger. Each credential has a different usage purpose, and our reporting system keeps track of the creation times of these credential schemas.

Credential issuance, mostly coming from our integrations, is recorded in our Hyperledger Aries system to keep track of the elapsed time. Our database holds records of which user was issued which credential at what date and how much time has elapsed since issuance. During integration, if the user is not registered in our system, we create a wallet for them to avoid any issues and ensure the integration is not interrupted. If the user is not registered, the elapsed time increases. Since I-Benefit's supported features are generally developed for the Loyalty application, most of the incoming credentials are issued from the Loyalty application.

3.1.1.2. Analysis of Credential Usage

Thanks to our report system, we can track the usage counts of users' credentials and their habits. In I-Benefit, we keep statistics such as how many credentials are shared with an institution, how many credentials are revoked, and how many times they are verified offline with a QR code. These statistics will help to generate usage reports and improve the user experience in the future.

Since our system is not yet open to user usage, the data we have is from the demos we've done. It's difficult to analyze credential usage without real user data. However, since the main idea behind I-Benefit is to expand the usage areas of the Loyalty application, we predict that the Benefit credential, which can be converted to shopping and gift tokens, will be the most used. The second most used credential will be the one that allows us to access Brutflix. Since users will want to watch PG rated content, the usage of the Identity Card credential will be proportional to the usage of the Brutflix credential. We believe that the expansion of the usage areas of the Identity Card, and its support by the government, will make its usage much higher than the remaining credentials.

3.1.1.3. Analysis Based on the Website Usage

Thanks to the website-based analysis, we can see how many users are registered in our system and how many times they are logged in with date information. In this way, we can find the hours when the system is busy and we can work to speed up the system during these hours.

Keeping a record of users' activities can improve the experience by making the frequently used parts more noticeable and by throwing the less used parts a little further back. In this section, we can see which agent the users have connected with, how much the tax deduction feature has been used, how many credential tokens have been transferred to public chains, how many times the credential and DID details have been viewed, and how many pdf has been downloaded. For example, on the Add Connection page, we can provide a better experience for new users by putting the frequently connected agent first.

3.1.1.4. Analysis for Agents

Tracking the activities of 3rd parties and other agents helps us to improve them with these institutions when requested. In this way, they can have an idea about the new features of the system. Furthermore, they can develop the features they have created with information such as how many times the user has encountered a proof request, how many times the users have accepted this request, and how many have rejected it.

Since our system operates through integrations, the usage of the I-Delta agent, which we provide integrations for, was higher than the usage of the remaining agents. Therefore, we placed the I-Delta agent at the top of the list of agent names on the Add Connection page.

As integration is currently the key point of the system, the most used agent is I-Delta agent. Benefit, Brutflix, and Ticket credentials come from the integration of the Loyalty application, and Canada credentials come from the integration of the Energy Wallet application. Since we perform these integrations through the I-Delta agent, it is the most used agent.

3.1.2. Performance Reports

With performance reporting in our system, we can see the places where users get slow responses while using the system. In this way, we can find the bottlenecks and frequently used parts we need to optimize and speed up. There are three main performance reporting modules.

DLT Performance Reporting Module: Writing something to DLT can be slow compared to the rest of the system. While any operation in the system takes a maximum of 500 ms, any write transaction applied to the DLT can take several seconds depending on its type. The average time to create a credential schema and add it to the DLT is around 30 seconds. The average time to add a user's DID to the DLT is around 10 seconds.

Web Application Performance Reporting Module: Each transaction performed by the users in the web application is recorded along with the response time. In this way, users will be able to appear in our system when they receive an error. The time spent by users in their transactions will shed light on where we need to optimize. The transactions made by the users

are completed within 300 ms on average. However, to give an example, the average time it takes to verify a proof that has been created is 800 ms. To reduce this time, we need to optimize on the Hyperledger Aries side. These times may vary depending on the user's connection speed and the availability of the server.

External Chain Performance Reporting Module: In our system, users can convert gift token credentials obtained from the Loyalty application to the IDLT token available on Ethereum, Avax, or Polygon blockchains. Since these blockchains are public chains, there is no optimization we can make for transactions on these networks. However, since we monitor the completion times of transactions, we can give feedback to users that the network is busy during peak hours. We can say that the completion time of the transactions is generally 15 seconds on average.