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Data traceability model implementation in the Rucio data lake

In recent years, blockchain has emerged as a promising technology for managing trusted information and facilitating the management of critical data by businesses and the public while maintaining high levels of security. Permissioned blockchains, unlike permissionless ones, restrict access to a select group of authorized entities, ensuring a controlled and secure environment. It is particularly valuable in sectors where data sensitivity and confidentiality are crucial.

As part of the Innovation Grant named "Interoperable Data Lake" (IDL), WP4 aims at leveraging blockchain to ensure the traceability and validity of the data and related metadata stored in the data lake. In such respect, a private blockchain has been defined and implemented in a way that stores the hash of the file's content, the hash of its associated metadata, and the Data IDentifier (DID) provided by Rucio (the CERN solution for distributed data management) for each file present in the data lake. During data retrieval, this information is read from the blockchain and used to verify the consistency of the data.

In this regard, Hyperledger Fabric was carefully evaluated during the definition process and subsequently implemented into the software platform to enable distributed ledger implementation. Hyperledger Fabric allows the creation of smart contracts in various programming languages (i.e. Go, JavaScript, and Java) and features a modular architecture to customize the components of the blockchain network.

As part of the integration process, a plugin to perform read and write operations on the blockchain (triggered by the Rucio client whenever predefined events occur) has been developed and integrated into Rucio.

The solutions implemented in the above-described software platform aimed at leveraging blockchain to ensure data traceability and validity, together with the related integration process, will be presented and described during the presentation.

Giorno preferito

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