Architectures and Implementations of Data Spaces: A Comparative Study of Gaia-X and Eclipse Data Space Components Frameworks

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Abstract : For individuals and organizations, significant potential benefits were assured by sharing the data in a secure, trusted, and standardized environment. Technical trust and standards help each participant to use data space securely to share and access data. Sharing data in a safe environment helps acquire new business opportunities. Data sovereignty, interoperability, and trust were considered key factors to evaluate data spaces. Businesses and policymakers assure a fair data economy by integrating data space in organizations. A collaborative environment was needed to facilitate data sharing among organizations, satisfied with the implementation of different architectures using data spaces such as Eclipse Data Space Components (EDC), International Data Space Association (IDSA), Gaia-X, and Gaia-X Federation Services (GXFS). The last 15 years of application were reviewed and compared based on the architectures and implementations of different data spaces such as IDSA, EDC, Gaia-X and GXFS, EDC framework, IDSA, GXFS, data connector, data space architecture, characteristics of data space connectors, federated data spaces initiatives, data spaces overview, eclipse data space connector, designing data spaces, building data spaces based on technical overview, European future digital ecosystem based on Gaia-Vision and strategy of Gaia-Architecture. Empirical research based on an organized view was conducted. The current discussion elaborates on the systematic review of the impact of data space technology from various perspectives. The systematic review uses multiple databases such as IEEE Explore, Taylor & Francis, Science Direct, and Google Scholar to pursue publications on the impact of Data space from January 2019 to December 2024. The search results showcased a comparative review of 150 articles, out of which 20 were related to the IDSA, Gaia-X, and EDC architecture and implementation.

Keywords : IDSA, Gaia-X, Gaia-X architecture, EDC, EDC architecture, GXFS architecture, IDSA, data space connector

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