

Data Spaces Symposium

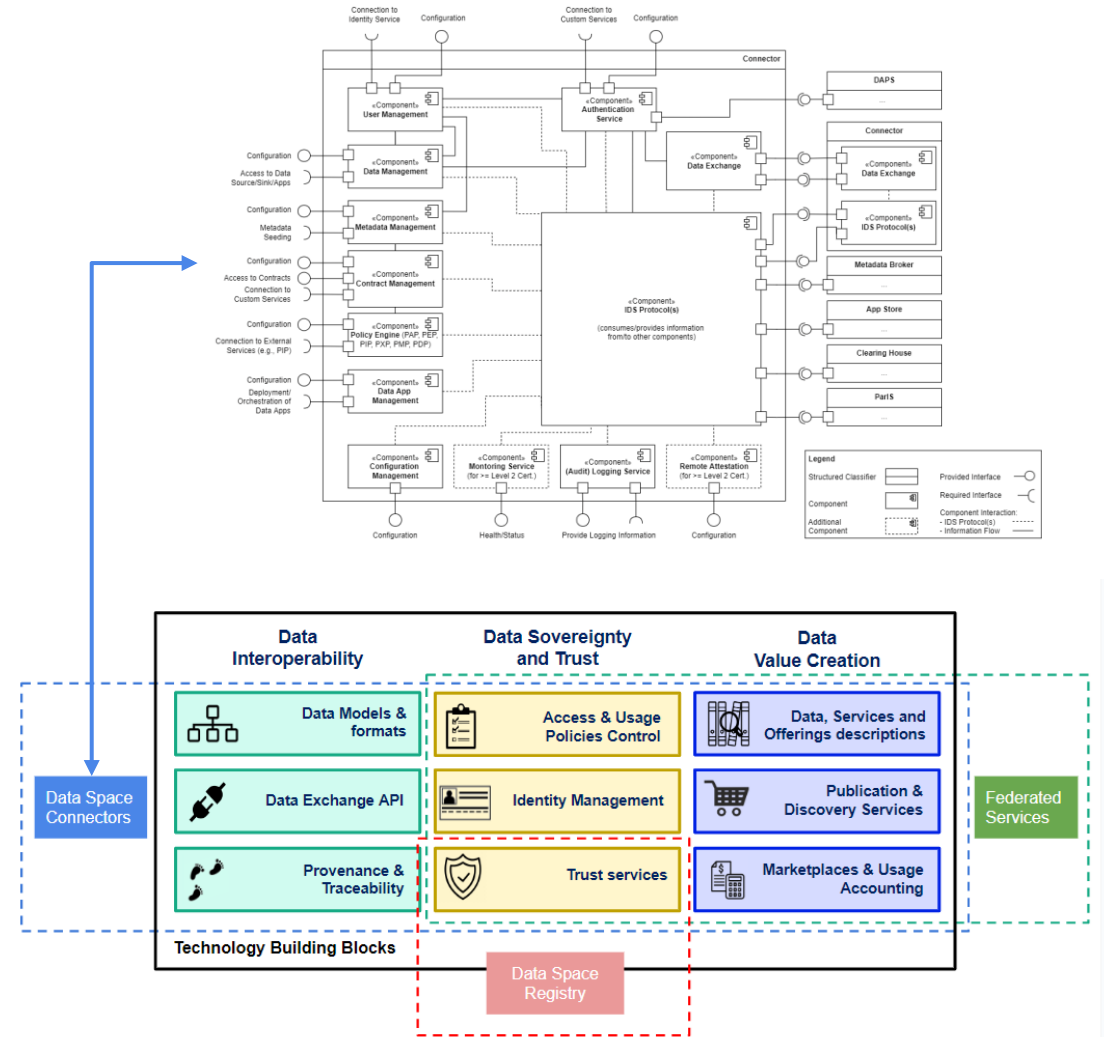
FIWARE Data Space Connector

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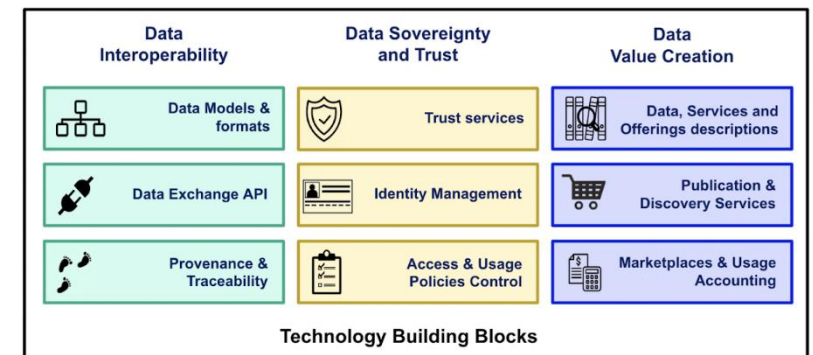
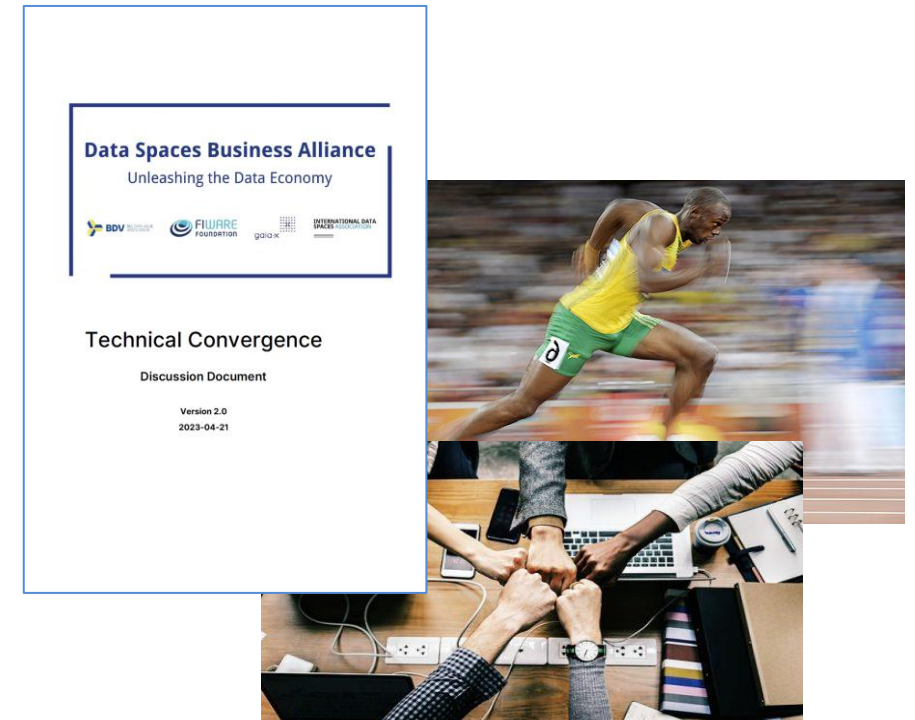
Evolution of Data Space Connector concept

- The concept of Data Space Connector has evolved to match the idea of an integrated suite of components every organization participating in a data space should deploy to “connect” to the data space
- These components would be deployed and configured in controlled environments (e.g., a Kubernetes cluster) and implement a number of services which may be required for an organization to connect in its role as provider of data services, consumer of data services or both:
 - Authentication (including the interface to trust services)
 - Authorization (policy enforcement)
 - Connection to Data Exchange APIs
 - Data resources publication (Metadata Management)
 - Contract Management
 - Logging
 - Remote Attestation
 - ...
- The concept of [Data Space Connector in IDS RAM 4.0](#) has evolved to support this vision

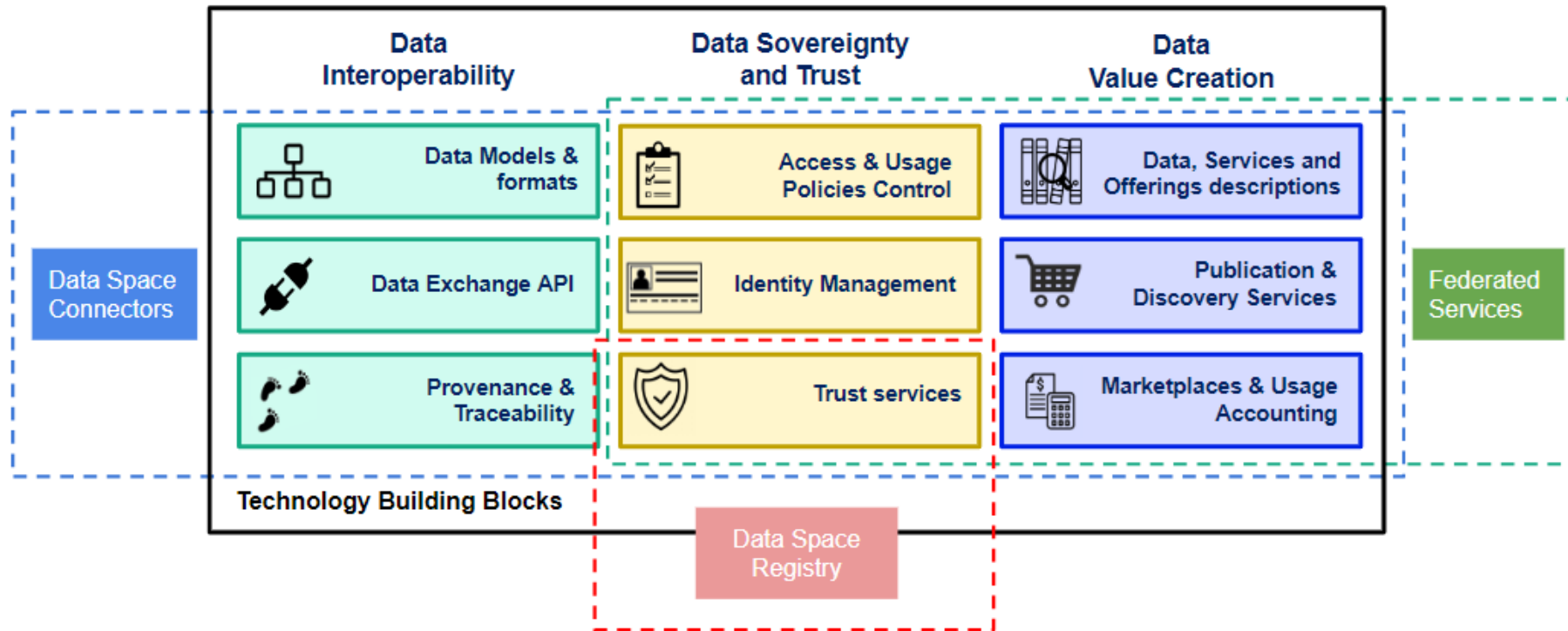


DSBA Technical Convergence version 2.0

- The DSBA Technical Convergence (TC) delivers a **Minimum Viable Framework (MVF)** enabling the creation of data spaces
- This MVF is based on the convergence of existing architectures and models, leveraging each other's efforts on specifications and implementations.
- A new edition of the DSBA TC (version 2.0) was released on April 21st - Major highlights
 - Description of common vision and conceptual model
 - Identification of major standards per technology pillar and specifications of how they get integrated
- Some initiatives committed to follow DSBA technical recommendations (others welcome to do the same!):
 - FIWARE Data Space Connector
 - iSHARE Trust Framework
 - DOME project under Digital Europe Programme



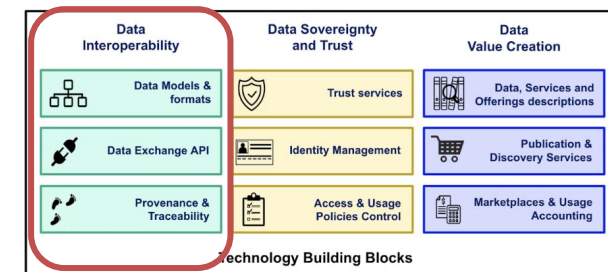
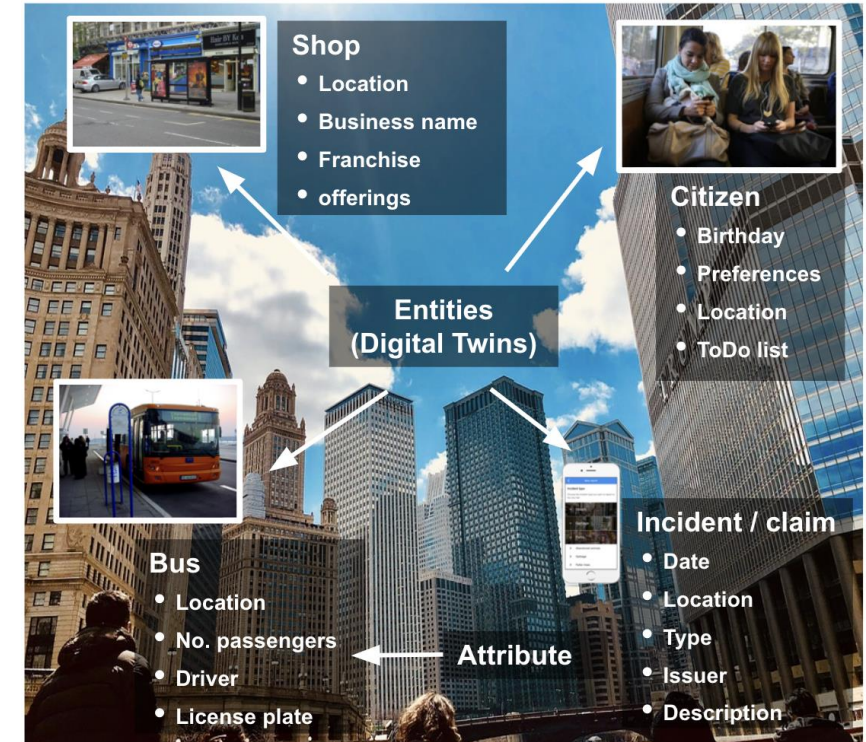
Technology Building Blocks for Data Spaces



MATERIALIZING DATA SPACES REQUIRES TO TAKE OPTIONS AND ADOPT A MINIMUM BUT ENOUGH SET OF TECHNOLOGY STANDARDS

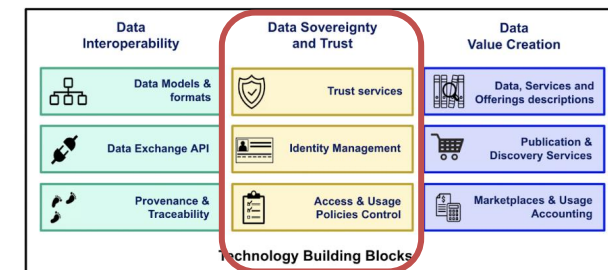
Data interoperability

- Providers of data products within data spaces must be able to offer data services at well defined endpoints knowing that customers, unknown by them a priori, will know how to consume their data services through those endpoints.
- This means that all participants in data spaces should ‘speak the same language’, addressing interoperability at several levels (see ISO/IEC 21823-1):
 - transport and syntactic level → common APIs
 - semantic level → common data models/vocabularies
- DSBA proposes [NGSI-LD](#) for transfer of digital twin data and Dataspace Connector Protocols for the Control of data transfer
- Adoption of common data models is encouraged and there are multiple references that may consider (ISO/IEC CIM for Energy, SAREF, ...) - the [Smart Data Models initiative](#) brings a hub that solves how different data models are mapped into JSON, JSON-LD and other data serialization formats
- In some data spaces, it may be necessary to make the data sharing process observable - to be addressed in future versions



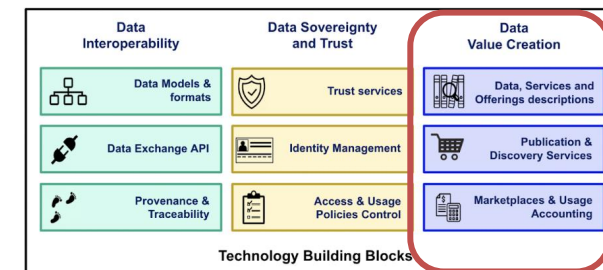
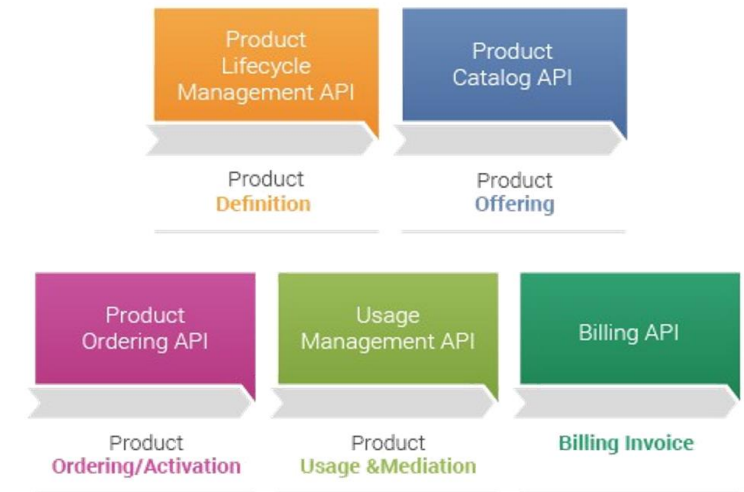
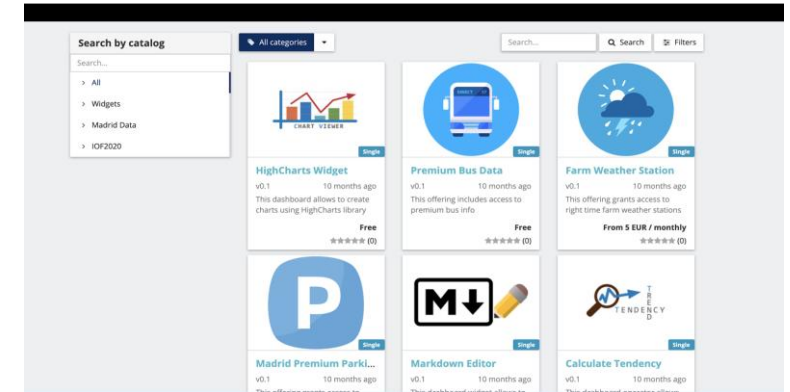
Data sovereignty and trust

- Any data space requires a Trust Framework bringing
 - Mechanisms for verifying legal identity
 - Mechanisms for verifying compliance with data space participation rules
 - Mechanisms for verifying trustworthiness of credential issuers
- On the other hand, it requires a decentralized Identity and Authorization Management (IAM) framework through which manage authentication and the enforcement of access/usage policies
- DSBA proposes a decentralized Trust framework compatible with the [EU Digital ID Wallet Architecture](#) and [EBSI](#)
- Decentralized IM based on latest W3C and OIDC standards:
 - W3C [DID \(Decentralized Identifiers\)](#), [Verifiable Credentials \(VC\)](#)
 - Verifiable Credentials Issuance Protocols: [OIDC4VCI](#)
 - Self-Issued OpenID Provider: [SIOPv2](#)
 - Verifiable Credentials Exchange Protocols: [OIDC4VP](#)
- Authorization framework following PEP-PDP-PIP and PRP/PAP architecture for ABAC (attributes \leftrightarrow claims in VCs), and adopting ODRL as Policy Definition Language



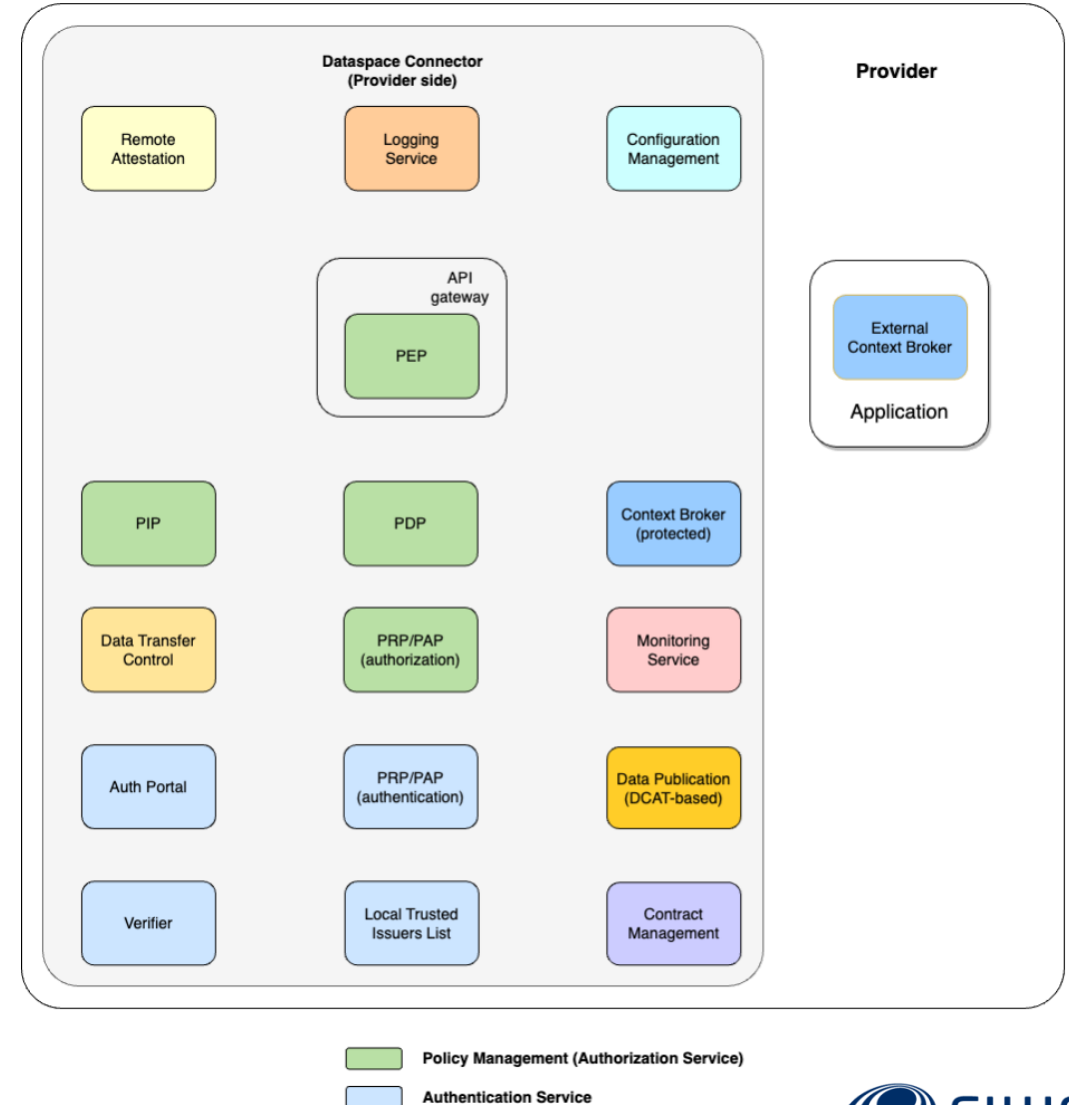
Data value creation

- Creating value out of data based on data sharing is the ultimate goal in data spaces. This follows basically the steps to:
 - Describe data, services, resources, products, offerings in an interoperable manner
 - Include data and service publication services to discover offerings facilitating connection of providers and consumers
 - Support contract negotiation peer-to-peer or through value-added services such as marketplaces
- Providers will be able to self-issue Verifiable Credentials linked to descriptions of their products/services/resources/data → goal is to align on common specifications for future editions
- Descriptions will be available through catalogs at connector level (supporting [DCAT v3](#)) or at data space level (Metadata Brokers or Marketplaces)
- [TM Forum APIs](#) bring the basis for managing offerings and support contract negotiation via marketplaces → to be supported in [DOME](#), goal is to align on how to support them at connector level



Compliance of Data Space Connectors with DSBA recommendations

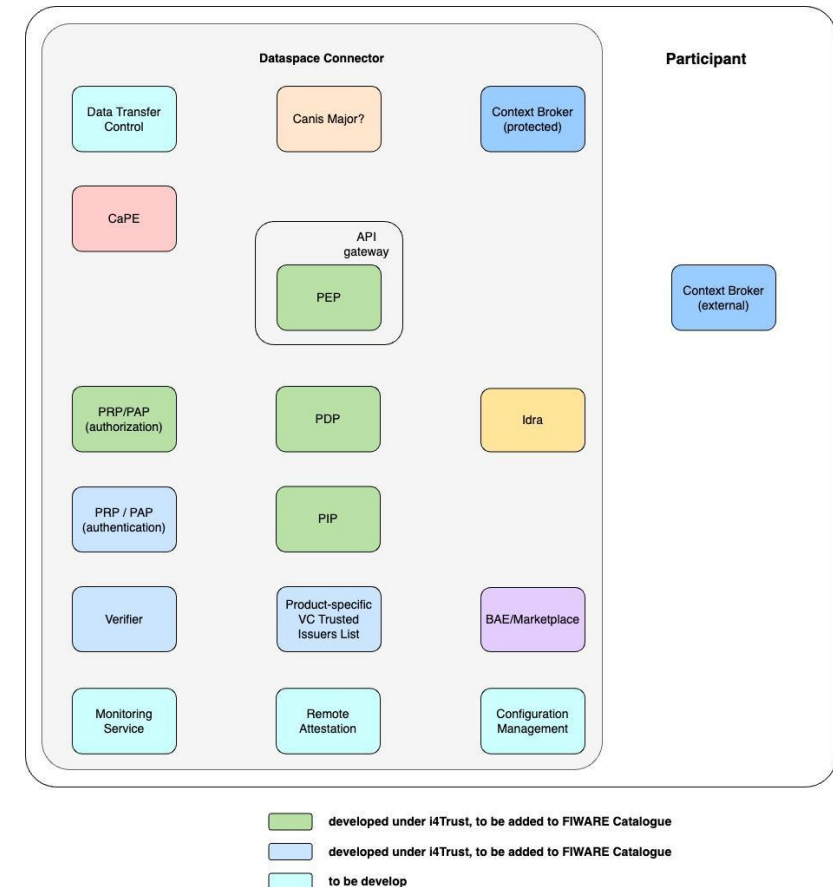
- Aligning with DSBA TC recommendations have several implications:
 - Interface with Trust Services should align with EBSI specifications (DID-Registry, Trusted-Issuers-Registry APIs but extended to support authentication based on VCs)
 - Authentication should be based on W3C DID + VC/VP standards and SIOPv2/OIDC4VP protocols and implement the interface to trust services
 - Authorization should implement a P*P architecture implementing ABAC using ODRL as policy language
 - IDS Dataspace Protocols considered a relevant input
 - Compatibility with NGS-LD as data exchange API
- How to implement Contract Management is under analysis since there are two approaches to reconcile:
 - In principle, TM Forum APIs would be a good candidate for Contract Management API
 - There has been some initial work in IDS RAM 4.0 regarding specification of a Contract Management protocol
 - Reconciliation is required



FIWARE Data Space Connector

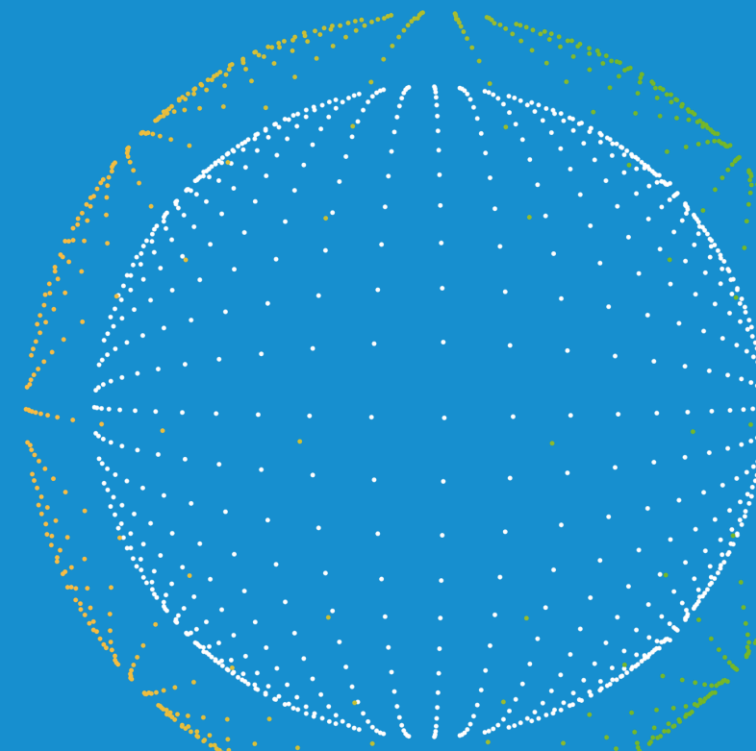
- A first release of FIWARE Data Space Connector components together with recipes for deployment was released September 2023 combining components already aligning with DSBA TC recommendations:
 - Context Broker technology for Data Exchange/Transfer
 - Trust and IAM components implementing W3C DID + VC/VP standards, SIOPv2/OIDC4VP protocols and interface to trust services based on EBSI APIs (DID-registry, Trusted Issuers Registry)
 - BAE modules implementing TM Forum APIs for contract negotiation
- For future releases, following modules will be incorporated:
 - Personal Data Consent Management modules (based on CaPE product from Engineering).
 - Idra product from Engineering as DCAT-compliant data resources catalog function for Metadata Management → aligning with IDS Dataspace Protocol
 - Transfer Control Protocol → aligning with IDS Dataspace Protocol
 - logging modules based on either BAE/marketplace functions for logging or, if we want to rely on blockchain, Canis Major
- The FIWARE Data Space Connector is the best aligned with DSBA recommendations available in the market

<https://github.com/FIWARE/data-space-connector>

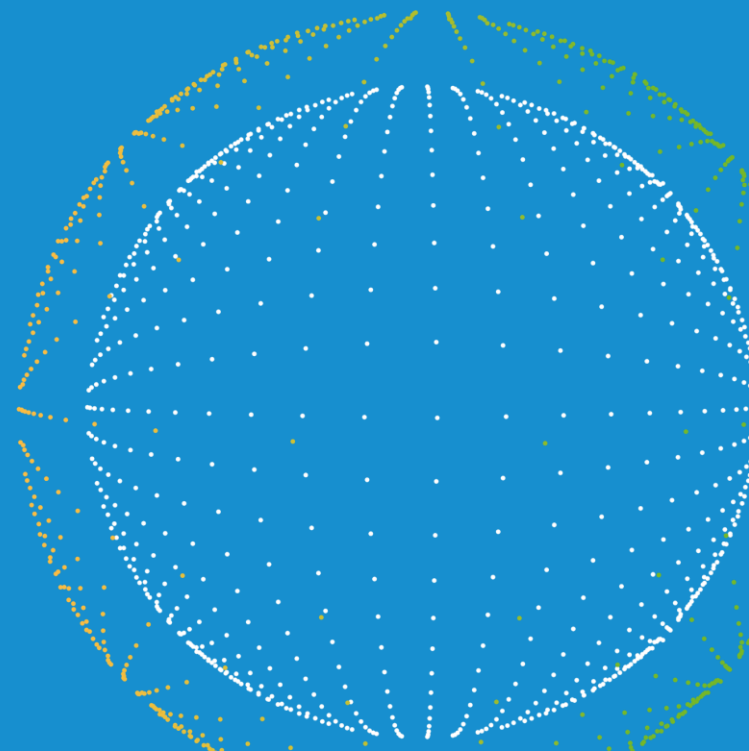


Thank you!

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Backup



Data Spaces Business Alliance (DSBA): joining forces

BDVA, FIWARE, GAIA-X and IDSA launched the **Data Spaces Business Alliance (DSBA)** to accelerate Business Transformation in the Data Economy (Sep 23rd, 2021)

- **One voice and a common framework** to make interoperable Data Spaces happen;
- Together, the Alliance's founding organisations represent **1,000+** leading key industry players;
- With its combined **cross-industry expertise, resources and know-how**, the Alliance drives awareness and rely on **more than 100 Hubs** for dissemination
- **Technical Convergence discussions** towards common reference technology framework for creation of Data Spaces:
 - Agile approach based on delivery of subsequent versions of a Minimum Viable Framework (MVF) specification where we do not only identify standards and target components but how to integrate them
 - Once alignment on relevant topics within several of the ongoing workstreams is achieved, the publication of a new version of the DSBA Technology Convergence document will be published to incentivize development of compliant implementations

