FIWARE Data Space Components for Gaia-X, IDSA and DOME -compatible data spaces

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Open APIs
for Open
Minds

FIWARE

FIWARE vision for data spaces

- Data Spaces are not just about peer-to-peer exchange of data / datasets / files !!

- Data Spaces enable organizations to:

  - seamlessly extend their map of systems by integrating systems from third parties: App providers (including AI services providers), Data Service providers, other organizations

  - easily become system providers (so other organizations can seamlessly integrate their data services)

- Of course, each system offers a collection of:

  - data services (services for accessing data)

  - data processing services (which receive, process and generate data)

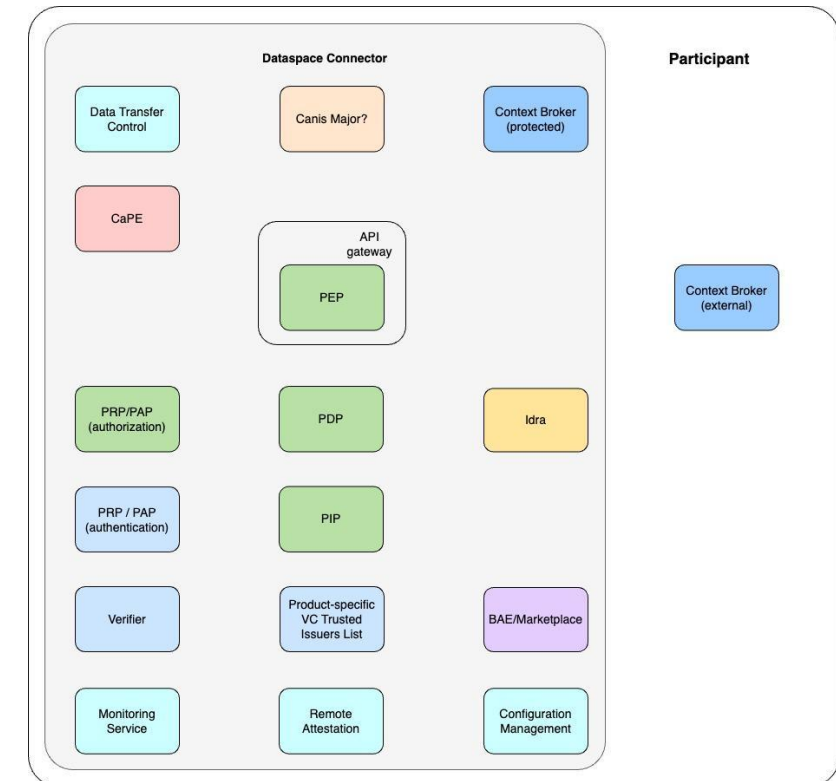- That is why we say data is central in Data Spaces !!
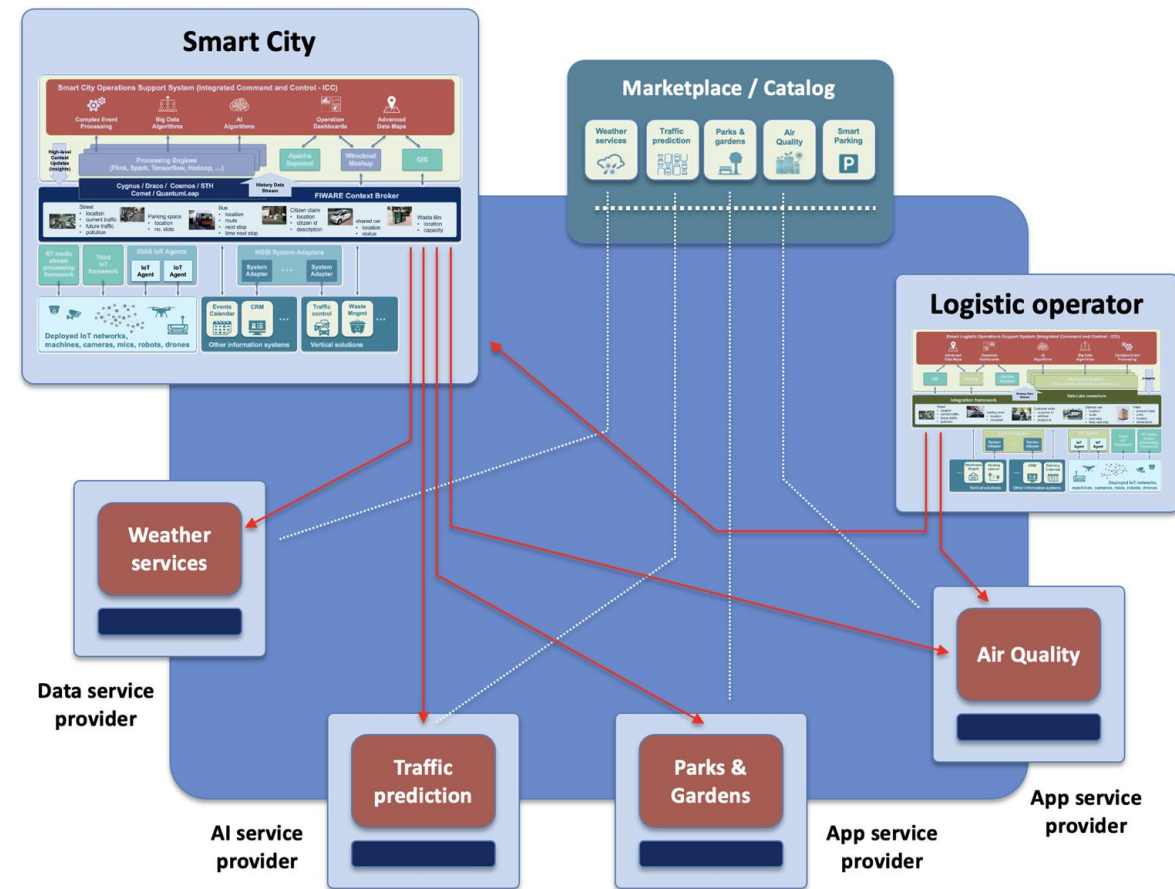
Data Spaces systems
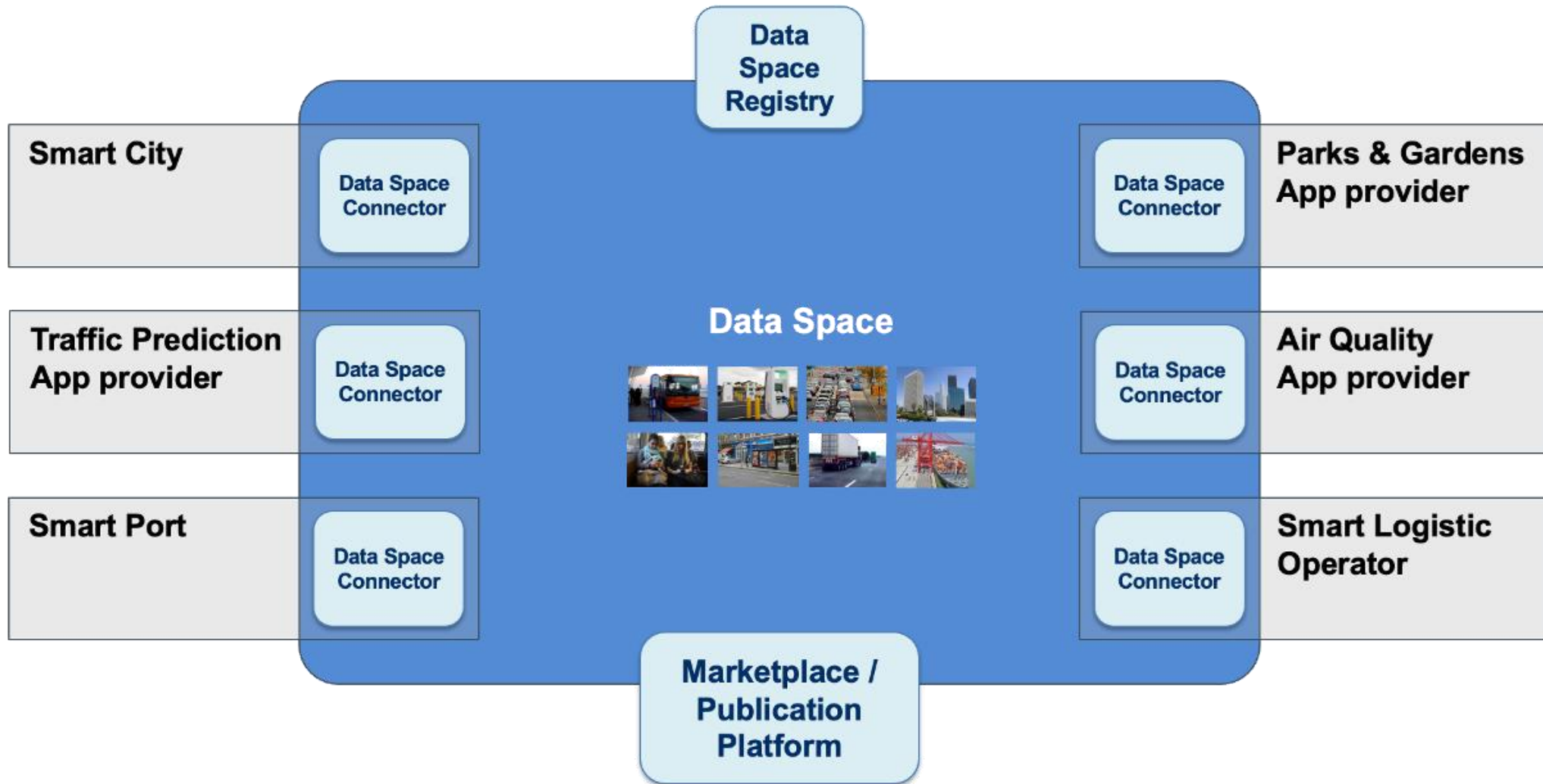
FIWARE Data Space Connector: enabling DSBA-compliant data spaces

- The FIWARE Data Space Connector comprises a number of software components already aligning with DSBA TC recommendations:
  - Context Broker technology for Data Exchange/Transfer
  - Trust and Identity Management components implementing W3C DID + VC/VP standards and SIOPv2/OIDC4VP protocols, and the interface to trust services implementing extended EBSI APIs (Trusted Issuers Registry) like in the case of Gaia-X Digital Clearing Houses (GXDCHs)
  - Authorization Management components enforcing policies specified in ODRL
  - Components implementing TM Forum APIs for contract negotiation (BAE marketplace components may be configured on top to contract via portal) therefore ensuring compatibility with DOME

- Coming soon (end of 2024):
  - Support to IDS Transfer Process Dataspace Protocol
  - DCAT-compliant data resources catalog for discovery, supporting IDS Catalog Dataspace Protocol

- For future releases, following modules will be incorporated:
  - Personal Data Consent Management modules.
  - Logging and remote attestation modules

- The FIWARE Data Space Connector is the best aligned with DSBA recommendations and compatible with DOME available in the market

Dataspace Connector   **Participant**

Data Transfer Control	Canis Major?	Context Broker (protected)
CaPE	API gateway — PEP	Context Broker (external)
PRP/PAP (authorization)	PDP	Idra
PRP / PAP (authentication)	PIP	
Verifier	Product-specific VC Trusted Issuers List	BAE/Marketplace
Monitoring Service	Remote Attestation	Configuration Management

- developed under i4Trust, to be added to FIWARE Catalogue
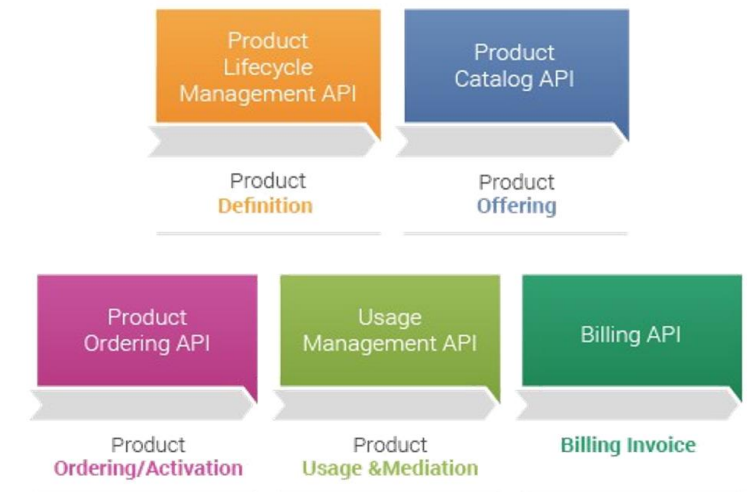- developed under i4Trust, to be added to FIWARE Catalogue
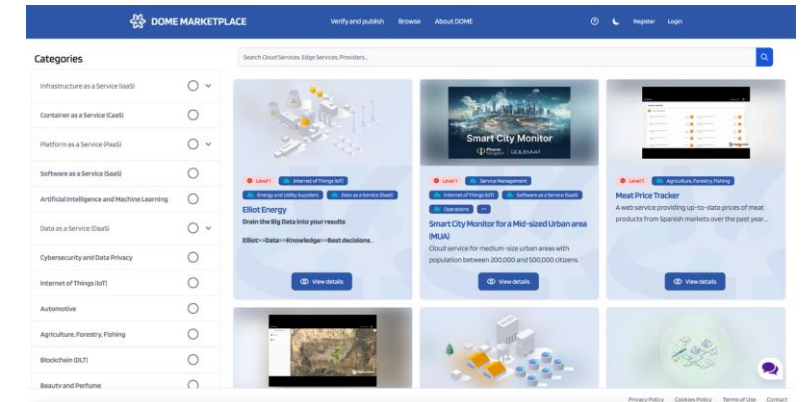- to be develop

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Compatibility/integration with Gaia-X

- Gaia-X Digital Clearing Houses (GXDCHs) as Trust Anchors for FIWARE Data Spaces → Verifier component in the FIWARE Data Space Connector relyin on Gaia-X Registry APIs

- Support to Gaia-X Verifiable Credentials Formats → handled by Verifier component of the FIWARE Data Space Connector

  - TrustAnchorCredentials as base of the Data Space Trust Anchor

  - MembershipPartyCredentials for Participants

  - PartyCredentials and their specializations (e.g. Employee Credential) to be used by Legal and Natural Persons

- Authentication will therefore be supported for users sending VerifiablePresentations containing Gaia-X Credentials

- Support to the Gaia-X ODRL VC Profile → Authorization module of the FIWARE Data Space Connector can manage policies formulated over VCs
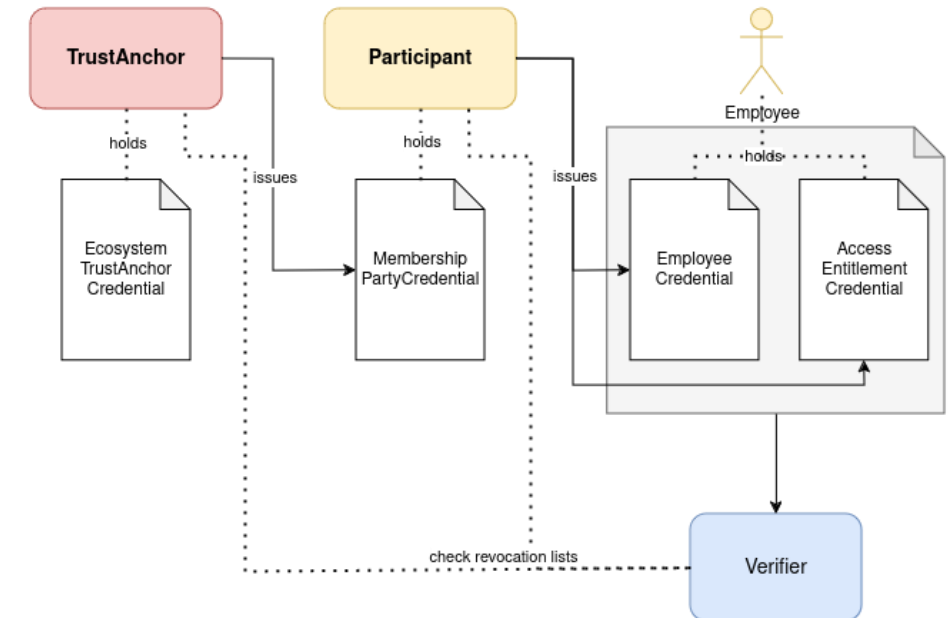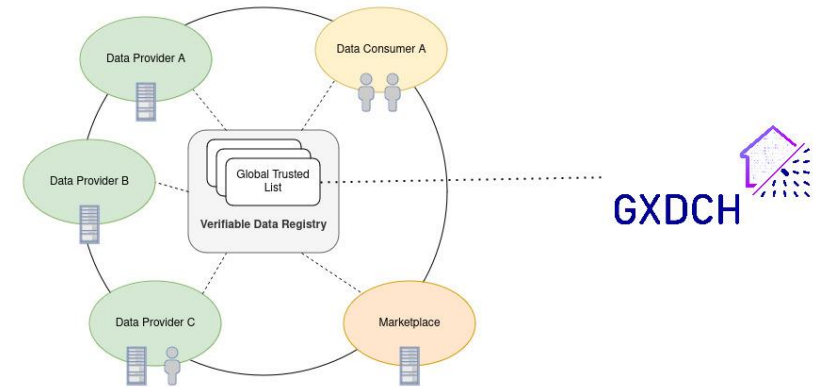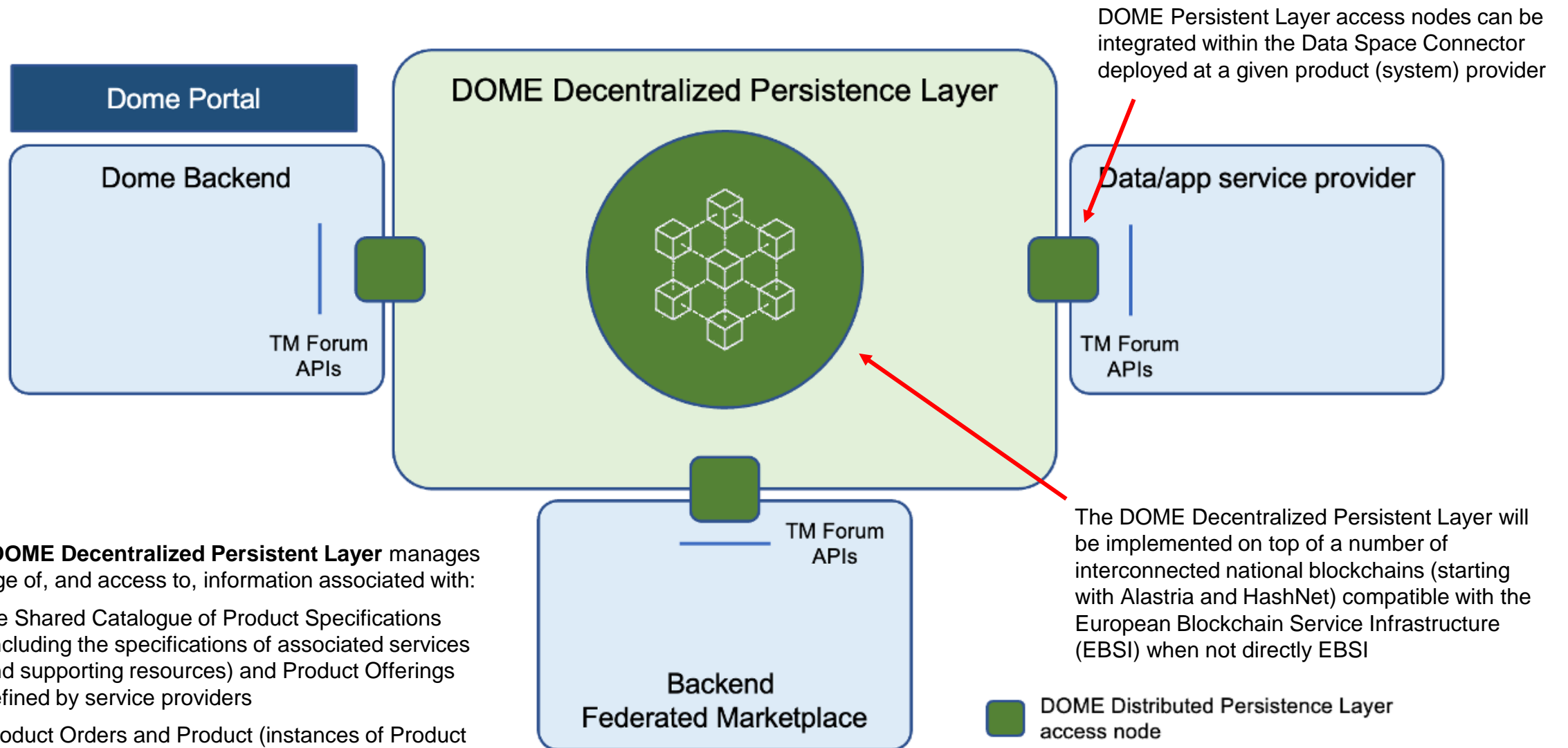
DOME: Distributed Open Marketplace for Europe

- **DOME** will take the form of a shared digital catalogue of cloud and edge services made available through:
  - the global DOME portal; or
  - federated marketplaces

- DOME rely on TM Forum Open APIs for managing:
  - information of products provided by participants of the ecosystem, each comprising a set of services (e.g., data service APIs) and supporting resources (e.g., required storage capacity)
  - information of product/service/resource specifications, agreement specifications and product offerings
  - the lifecycle of agreements and products (covering their ordering, provisioning, activation, usage, …)

- DOME supports federation by implementing TM Forum Open APIs on top of a distributed ledger:
  - every actor (federated marketplaces, product providers) connect to the distributed ledger using access nodes exporting TM Forum Open APIs
  - every request using TM Forum Open APIs on a given access node gets propagated to rest of nodes and turn visible to corresponding parties

Marketplaces federation + Shared Catalogue (Architecture)

Dome Portal

Dome Backend

TM Forum APIs

DOME Decentralized Persistence Layer

TM Forum APIs

Backend Federated Marketplace

DOME Persistent Layer access nodes can be integrated within the Data Space Connector deployed at a given product (system) provider

Data/app service provider

TM Forum APIs

The DOME Decentralized Persistent Layer will be implemented on top of a number of interconnected national blockchains (starting with Alastria and HashNet) compatible with the European Blockchain Service Infrastructure (EBSI) when not directly EBSI

DOME Distributed Persistence Layer access node

The **DOME Decentralized Persistent Layer** manages storage of, and access to, information associated with:

- the Shared Catalogue of Product Specifications (including the specifications of associated services and supporting resources) and Product Offerings defined by service providers
- Product Orders and Product (instances of Product Specifications) along their lifecycle, as well as information about actual Usage of Products
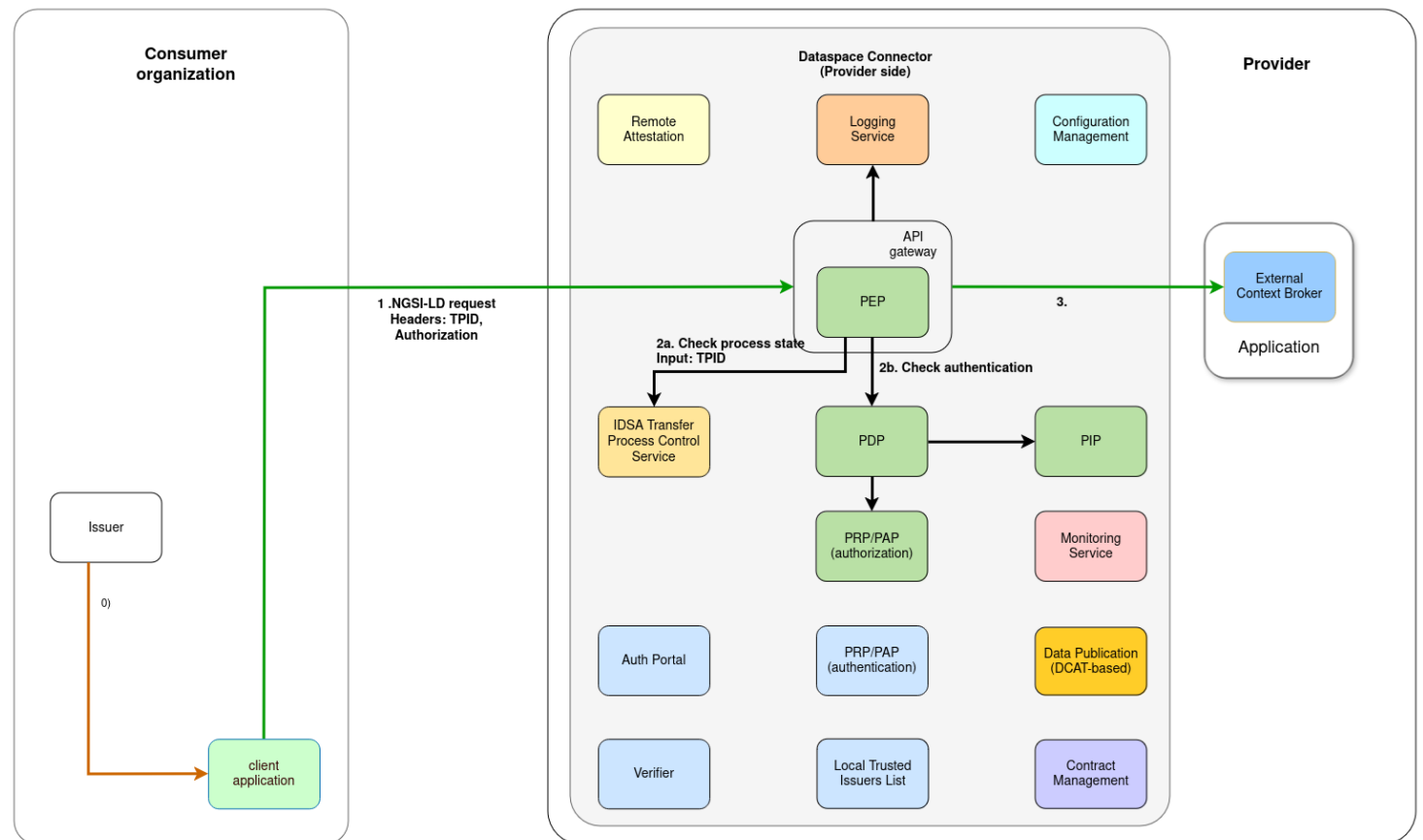
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Data Space Connector - Access Node Integration

- Data Service is offered at the Marketplace and can be purchased by a Consumer
- Data Space Connector integrates through TMForum-EventListeners
- Contract Management reacts on purchase, registers the new consumer
- Consumer is now allowed to authenticate for the service
- Consumer can access the service
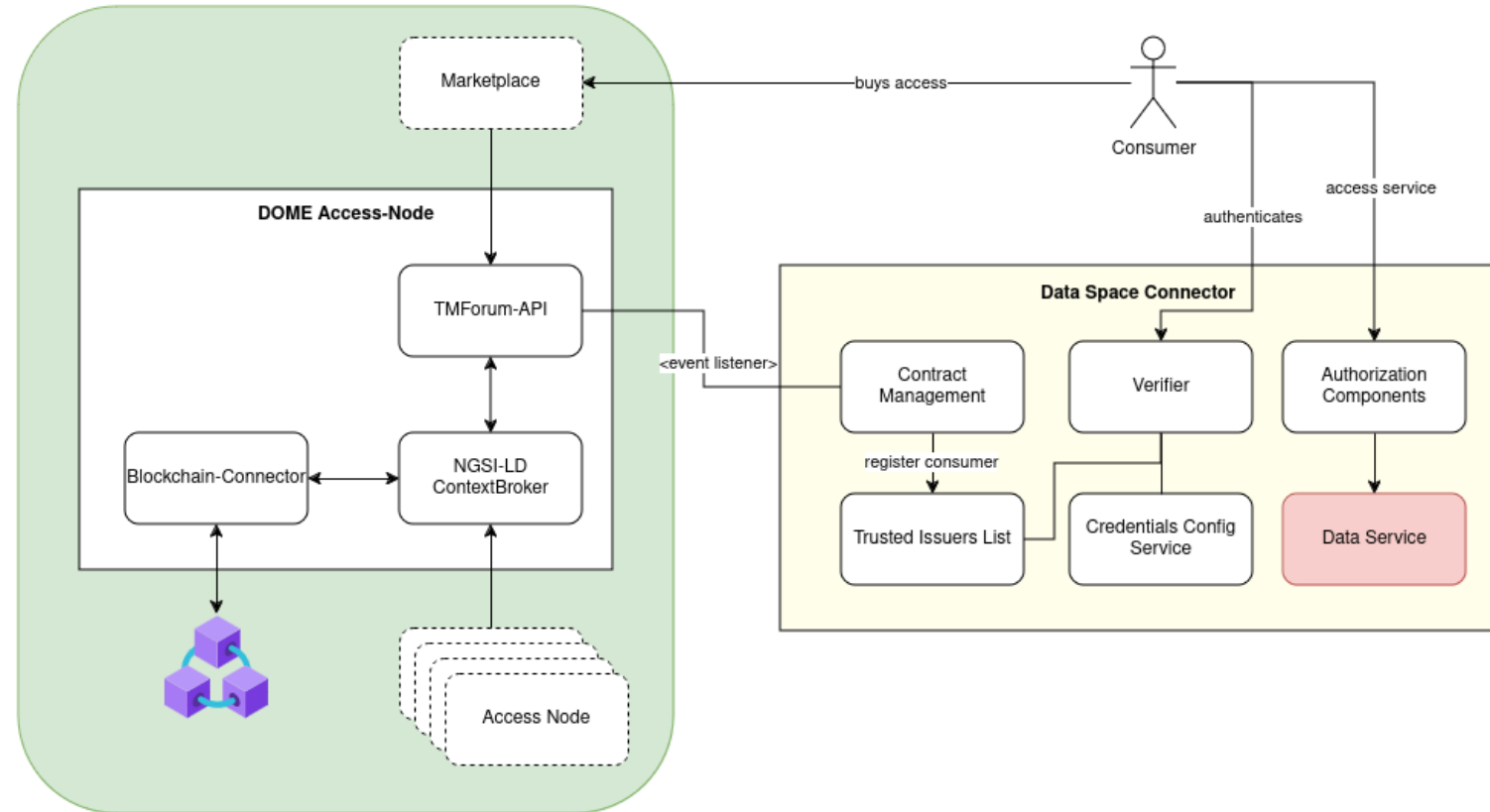
Support to IDSA Transfer Process and Catalog Dataspace Protocols

- The FIWARE Data Space Connector will comprise a DCAT-compliant catalog where available products are listed
- Using TM Forum APIs, consumers can negotiate an agreement for gaining access to products (i.e., corresponding data services)
- A consumer that has reached an agreement for using a product can request a Data Transfer using corresponding data services
  - ➢ State "REQUESTED"
  - ➢ TPID returned to the consumer
- Consumer requests to start the transfer
  - ➢ State "STARTED"
- Consumer sends request to the PEP
  - ➢ includes TPID as header
  - ➢ includes authorization header
- PEP checks:
  - ➢ state of the Transfer Process
  - ➢ existing policies at the PDP
- If state=="STARTED and authorization is granted then the request is forwarded
- both participants can suspend, complete or terminate the process using the Transfer Process Control Service APIs

Summary

- FIWARE has a good track record in moving from vision to execution, making things happen!

- We shall not re-invent the wheel: leverage relevant open standards, open source frameworks compatible with EC regulations

- The FIWARE Data Space Connector accelerates the creation of data spaces aligning with Gaia-X and DOME, also mature enough IDSA Dataspace Protocols

Thank you!

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