

Open APIs  
for Open  
Minds

# FIWARE: Supporting computing continuum

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Few words about FIWARE...

# About FIWARE

## FIWARE Mission

to build an open sustainable ecosystem around public, royalty-free and implementation-driven software platform standards that will ease the development of Smart Solutions in multiple sectors

Technology that is free, for all, for ever

- Curated **framework of open source components** for smart solutions
- Royalty-free Common **Smart Data Models**
- **De-facto standard** in Smart Cities, growing adoption in other domains
- Compelling **Roadmap** (blockchain, AI, robotics, ...)



A growing **Ecosystem** around the technology

- **Partnership** with relevant initiatives (TMForum, IUDX, OASC, GSMA...)
- **FIWARE Marketplace** website publishing validated offerings
- **FIWARE Accelerator** helping startups to bring to the market "Powered by FIWARE" solutions



A vibrant **Community** engaged in the success

- Growing number of **members**: 130+ organizations, 300+ individuals
- Growing network of **iHubs** (FIWARE poles) and **Evangelists** acting locally
- **FIWARE Experts** recognized by our Certification Program

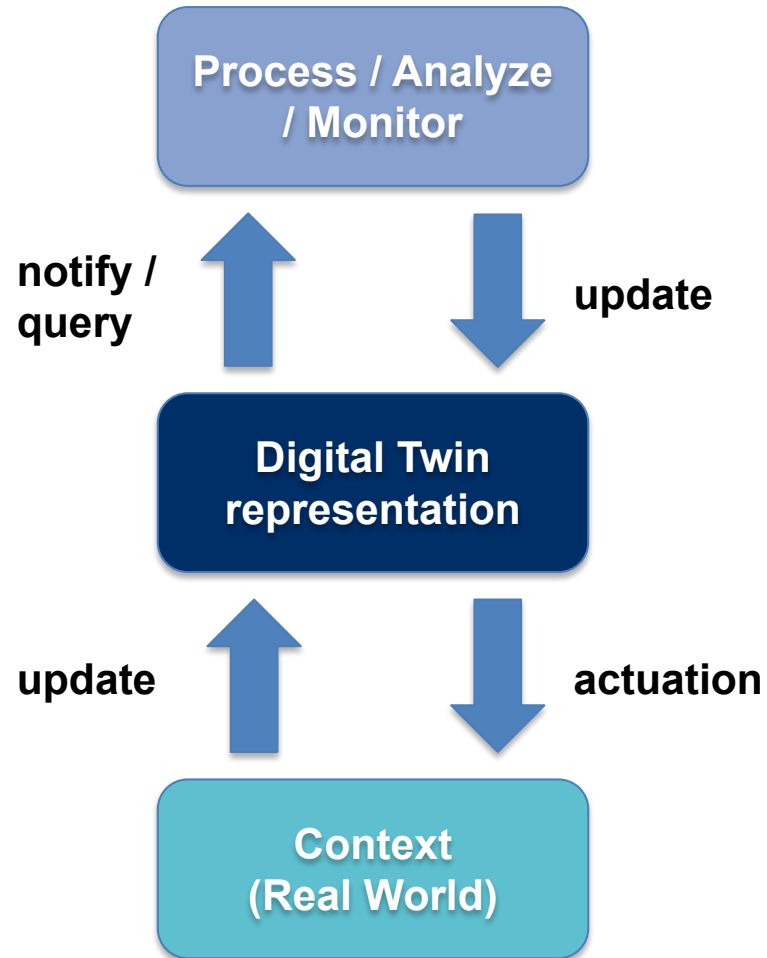


A **Foundation** bringing support and doing for the common good

- **Protecting** branding
- **Augmenting** partnerships and members
- **Supporting** the community
- **Promoting** FIWARE
- **Validating** FIWARE technologies and offerings



# FIWARE provides the basis for development of smart solutions, systems integration within smart organizations and data spaces in multiple sectors



- Any architecture “powered by FIWARE” gravitates around a “**digital twin representation**” of the real world (also referred as “context representation”) which is constantly keep up to date based on data from different sources and is constantly analyzed and processed in order to automate processes or bring support to smart decisions
- Creating a **digital twin representation** of the real world helps to address:
  - How the architecture of smart vertical solutions (e.g., waste management for cities) is architected
  - How systems within an organization (e.g., a city, a farm) can be integrated breaking the information silos
  - How systems from different organizations may exchange information within data spaces they build

# FIWARE & computing continuum

# FIWARE contribution to computing continuum

We are not providers of cloud, edge or IoT technologies but...

- We provide open source technology components and open standards
- To manage data and services across this continuum in a secure and efficient way
- With a major focus on:
  - Data Interoperability
  - Data sovereignty and trust
  - Data value creation
- Supporting the design and deployment of Common European Data Spaces
- Contributing to the technology roadmap (essential priorities) of the European Alliance for Industrial Data, Edge and Cloud about:
  - Open specifications & Open source reference implementations
  - Data-sharing business models
  - Support distributed & interoperable architectures
- And providing requirements for the future agenda on computing continuum

How materialize this contribution?

# Contribution to Open Specifications & open standards (I) - Data exchange API

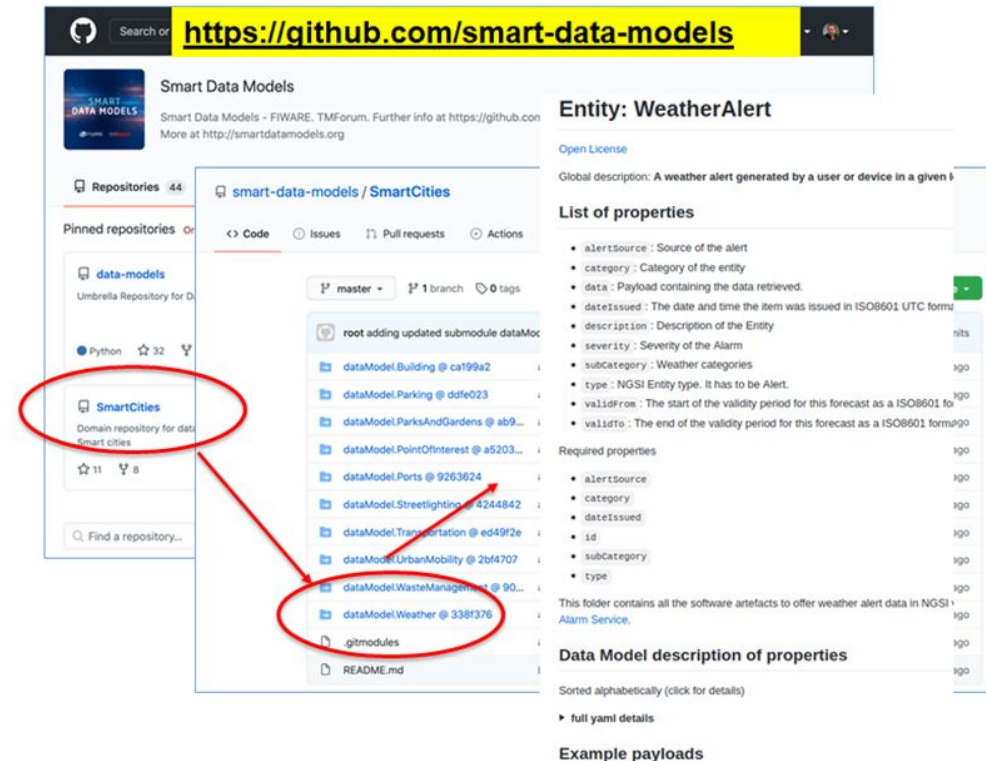
- The NGSiv2 defined by FIWARE provided the basis for the [NGSI-LD specs](#) published by ETSI (October 2019)
- ETSI created in Jan 2017 an [Industry Specification Group](#) (ISG CIM) for defining a Context Information Management API
- NGSI-LD is a simple but powerful REST API for getting access to context data in right-time
- FIWARE community provides several open source implementations of ETSI NGSI-LD, called Context Broker
- One of this implementations, [Orion Context Broker-LD](#), has become the [CEF Building Block](#)
  - recommended by the EC to public and private sector for publication of right-time context data
  - Useful for publication of Open Data in the European Data Portal





# Contribution to Open Specifications & open standards (II) - Smart Data Models

- More than 1000 data models in 13 domains and 7 languages
- 82 organizations, 126 individual contributors
- Relied on well-established "de-facto" standards
  - schema.org, SAREF, IEC CIM, DCAT-AP, CPSV-AP, GBFS, OSLO...
- Versus classical standardization:
  - Consensus by examples
  - Easy extension and quick versions
  - No backwards incompatibility
- <https://smartdatamodels.org/>

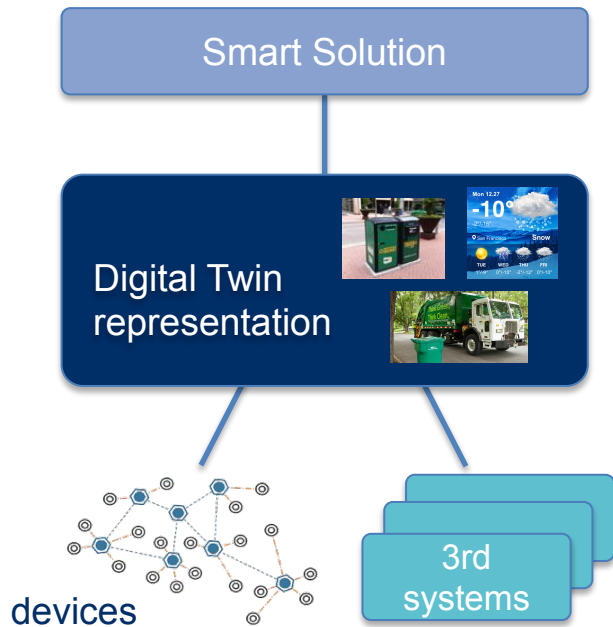


The screenshot shows the GitHub repository for Smart Data Models. The main repository is "Smart Data Models" with 44 sub-repositories. A red circle highlights the "SmartCities" repository, which is a domain repository for smart cities. A red arrow points from the "SmartCities" repository to a detailed view of the "WeatherAlert" entity. The "WeatherAlert" entity is described as a global description: "A weather alert generated by a user or device in a given location". The "List of properties" includes: alertSource, category, data, dateIssued, description, severity, subcategory, type, validFrom, and validTo. The "Required properties" include: alertSource, category, dateIssued, id, subcategory, and type. The "Data Model description of properties" section is also visible.

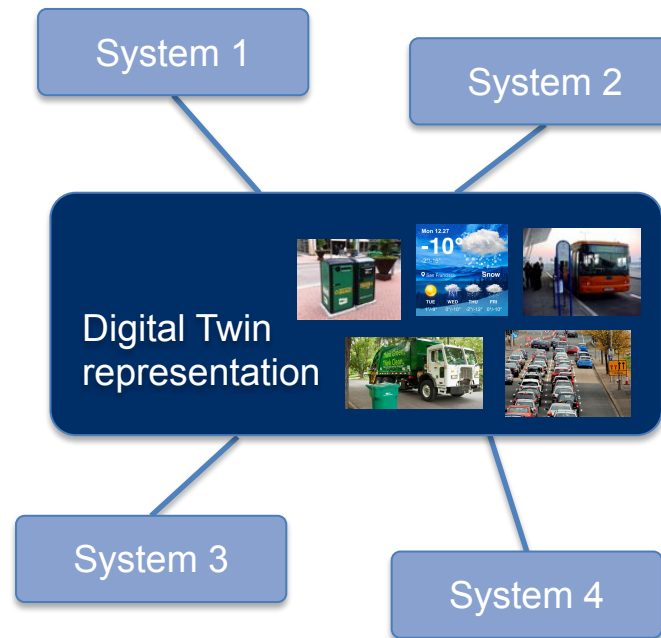


# Contribution to distributed & interoperable architectures - from centralized solutions to data spaces

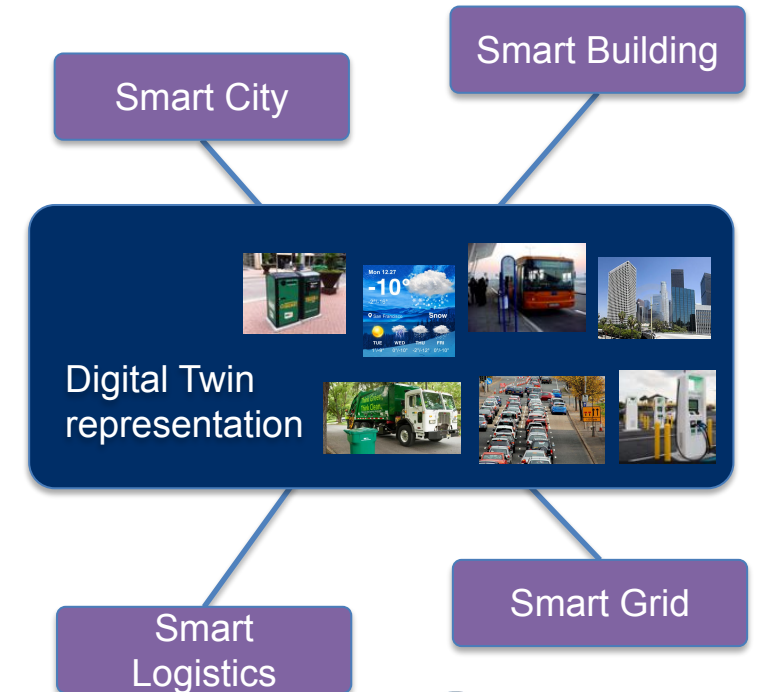
## Architecting Smart Solutions



## Integrating systems and sharing data within organizations

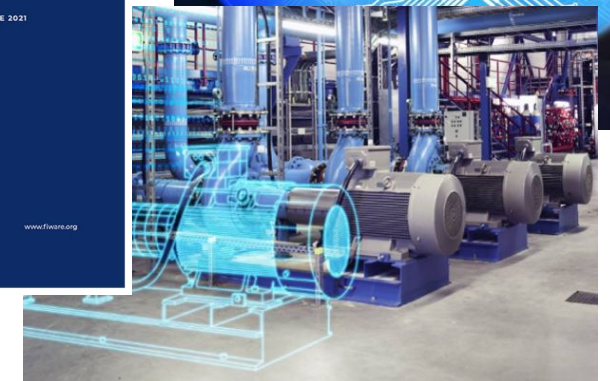
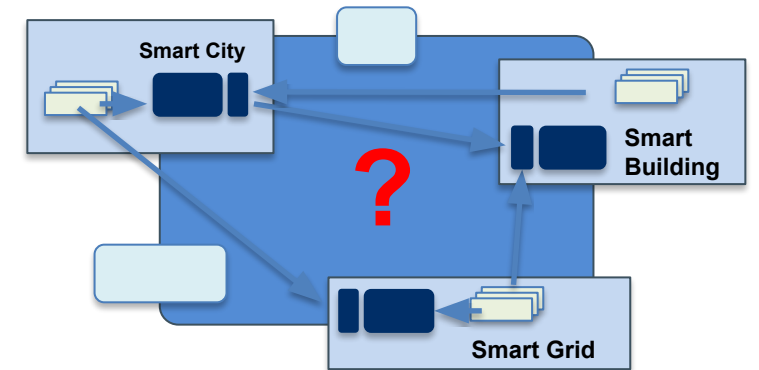


## Integrating systems and sharing data across organizations (data spaces)



# Contribution to data sharing business models - FIWARE vision on Data Spaces ([link](#))

- Fundamental **principles** in Data Spaces for a Data Economy
  - Data Sovereignty
  - Data level playing field
  - Private-public governance
  - Decentralized soft infrastructure
- This requires all participants to speak the **same “language”**
  - Data **exchange API**: the sentences you construct
  - Standard **data models**: what you speak about (vocabulary)
- And that they can exchange in a trustful and secure manner
  - **Trust Anchor Services** to verify membership, valid identity and credentials
  - Common mechanisms for **Identity and Access Management**
- Besides, also fundamental:
  - **Publication and Marketplace** services: how to discover, contract
  - Management of **quality, provenance and traceability**



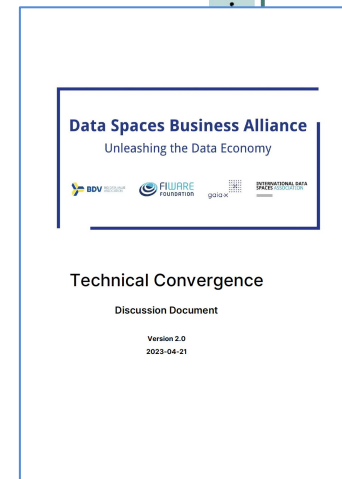
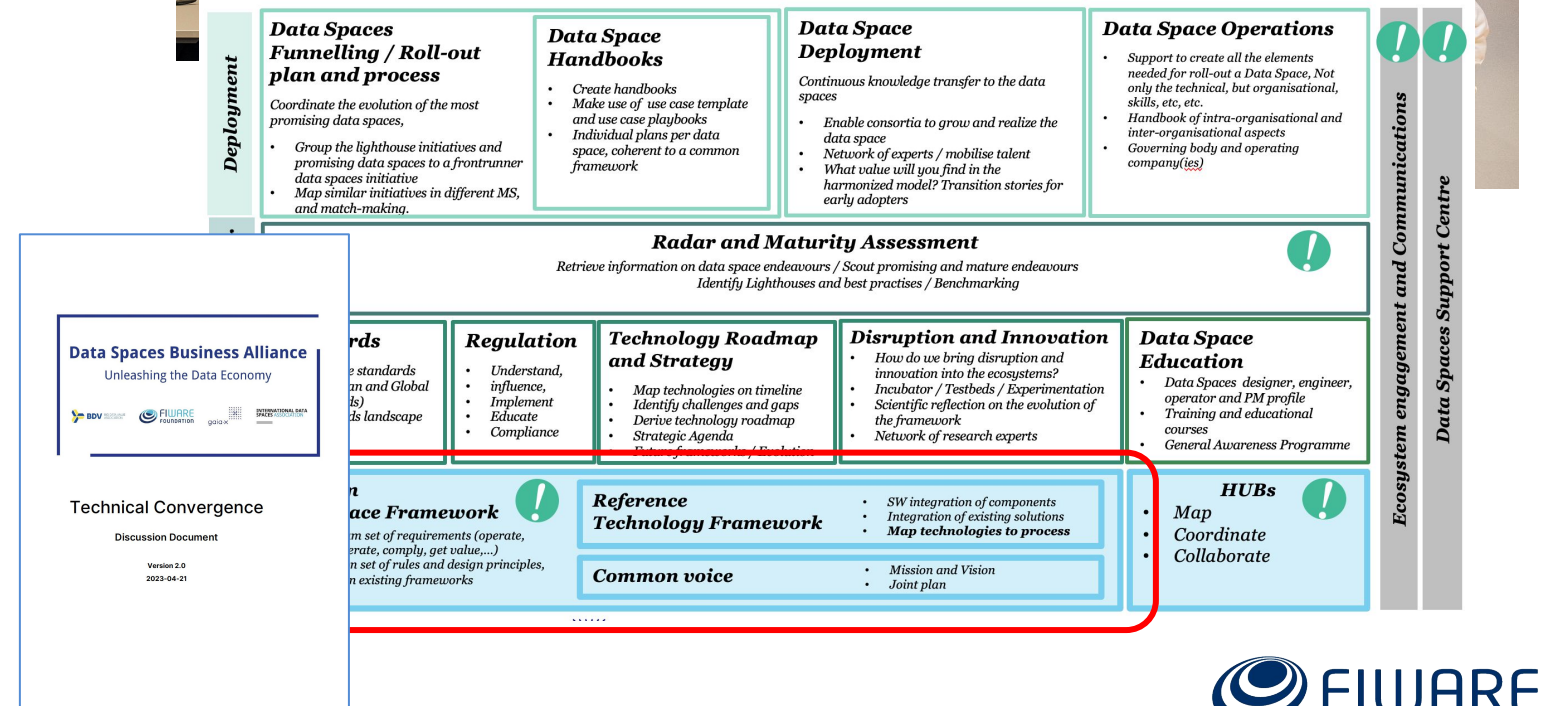


# Data Spaces Business Alliance: joining forces

BDVA, FIWARE, GAIA-X and IDSA launched the [Data Spaces Business Alliance \(DSBA\)](#) to accelerate Business Transformation in the Data Economy (Sep 23<sup>rd</sup>, 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
- [DSBA Technical Convergence document](#) provides a complete and complementary overview of the architecture and building blocks to implement data spaces



# FIWARE helps to make things happen: transferring results of research to the market ... we commit to do it for data spaces

Collaboration with iSHARE Foundation under the umbrella of [i4Trust program](#) and active participation in Gaia-X IAM WG (co-chairs)

- Trust Services APIs aligned with EBSI
- Support to DID+VC/VPs + SIOPv2 and OIDC4VP

Experience implementing IDS Connector functions (TRUE Connector)

DCAT-compliant Idrac component used in several market solutions

Marketplace Services open source components based on industry TM Forum standards used in i4Trust and now in DOME

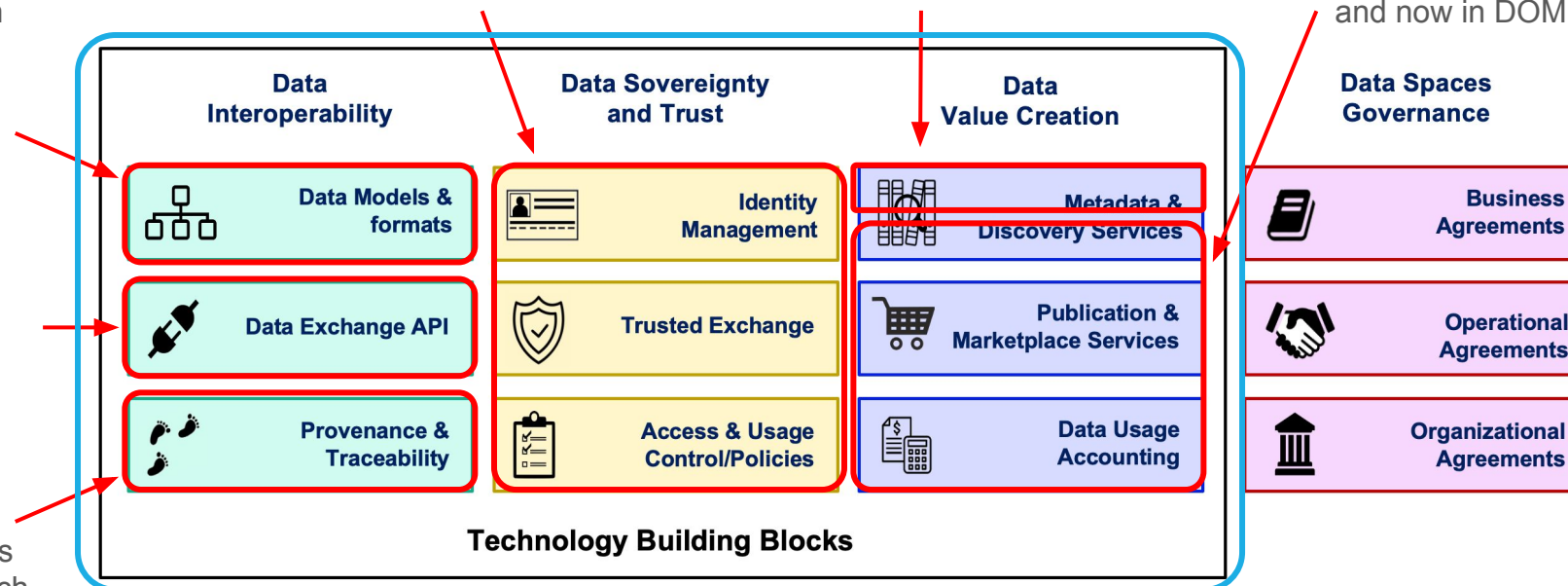
Driving fast-growing library of smart data models for developers ([website](#), [github](#)) following open agile approach

- 1000+ data models,
- 14K+ terms
- 100+ contributors

Driving standardization of API for context / digital twin data exchange: [ETSI NGSI-LD](#):

- de-facto for cities, growing adoption in other domains
- adopted beyond Europe

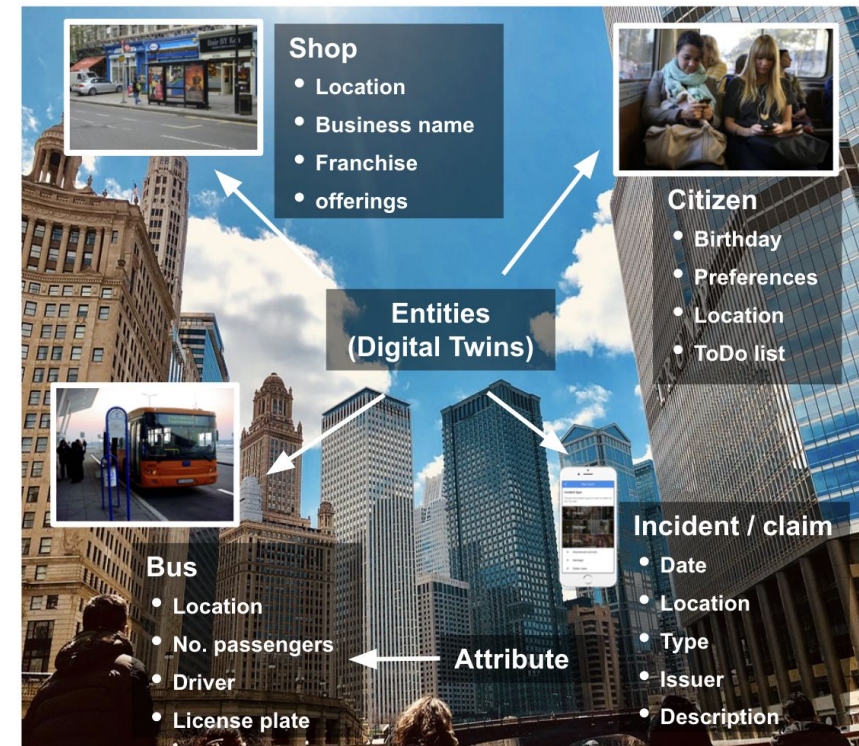
[Collaboration with Alastria](#) towards EBSI-compatible no-code approach for storing logs on context / digital twin data transactions on blockchain networks



Based on OpenDEI framework

# Data interoperability

- Building Blocks (starting baselines):
  - Data exchange API: [ETSI NGSI-LD API](#)
  - Data Models: [Smart Data Models initiative](#)
- Foreseen activities:
  - Evolution of NGSI-LD specifications within ETSI
  - Support to stream-based linked data exchange (LDES)
  - Definition of models following implementation-driven approach and contribution to Smart Data Models initiative
  - Tools and components for measuring/improving data quality
  - Components for managing traceability and provenance of data
  - Inventory of open source products compliant with reference specs
- Collaboration with relevant projects/initiatives:
  - [Data Spaces Support Center](#) (Digital Europe Programme)
  - [Data Spaces Business Alliance \(DSBA\)](#) and associations
  - [EBSI \(European Blockchain Service Infrastructure\)](#)
  - [Living-in.EU](#) / [OASC](#) (evolution of MIM-1, MIM-2)





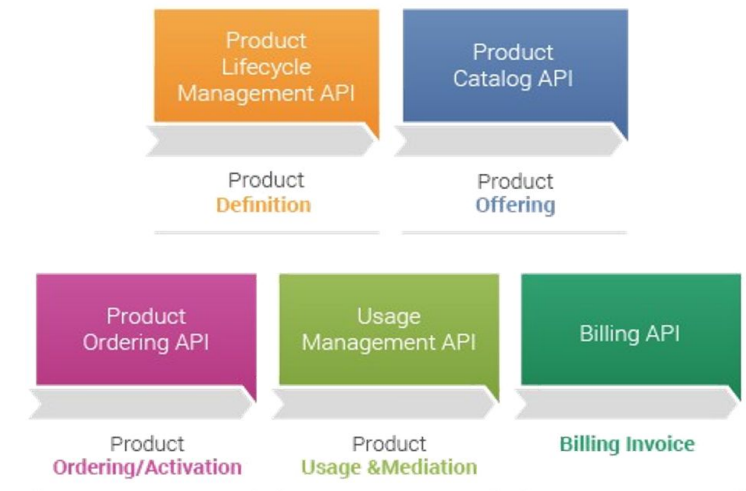
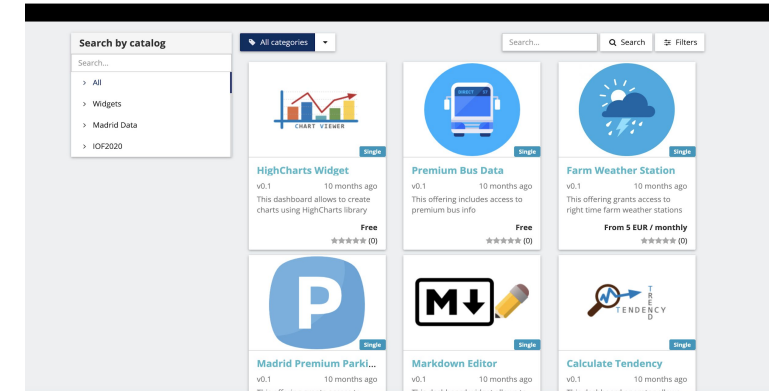
# Data sovereignty and trust

- Building Blocks (starting baselines):
  - Trust Anchor Framework compatible with [EU DI Wallet](#) and [EBSI](#):
    - Mechanism for verifying legal identity
    - Mechanism for verifying compliance with data space participation rules
    - Mechanism for verifying trustworthiness of credential issuers
  - Decentralized Identity and Access Management (IAM):
    - Verifiable Credentials Issuance Protocols: [OIDC4VCI](#)
    - Self-Issued OpenID Provider: [SIOPv2](#)
    - Verifiable Credentials Exchange Protocols: [OIDC4VP](#)
    - ABAC (Attribute Based Access Control) framework
- Foreseen activities :
  - Follow up technical convergence activities within DSBA
  - Inventory of open source products compliant with reference specs
- Collaboration with relevant projects/initiatives:
  - [Data Spaces Support Center](#) / DOME (Digital Europe Programme)
  - [Data Spaces Business Alliance \(DSBA\)](#) and associations
  - [EBSI \(European Blockchain Service Infrastructure\)](#)
  - [Living-in.EU](#) / [OASC](#) (creation of new MIM)



# Data value creation

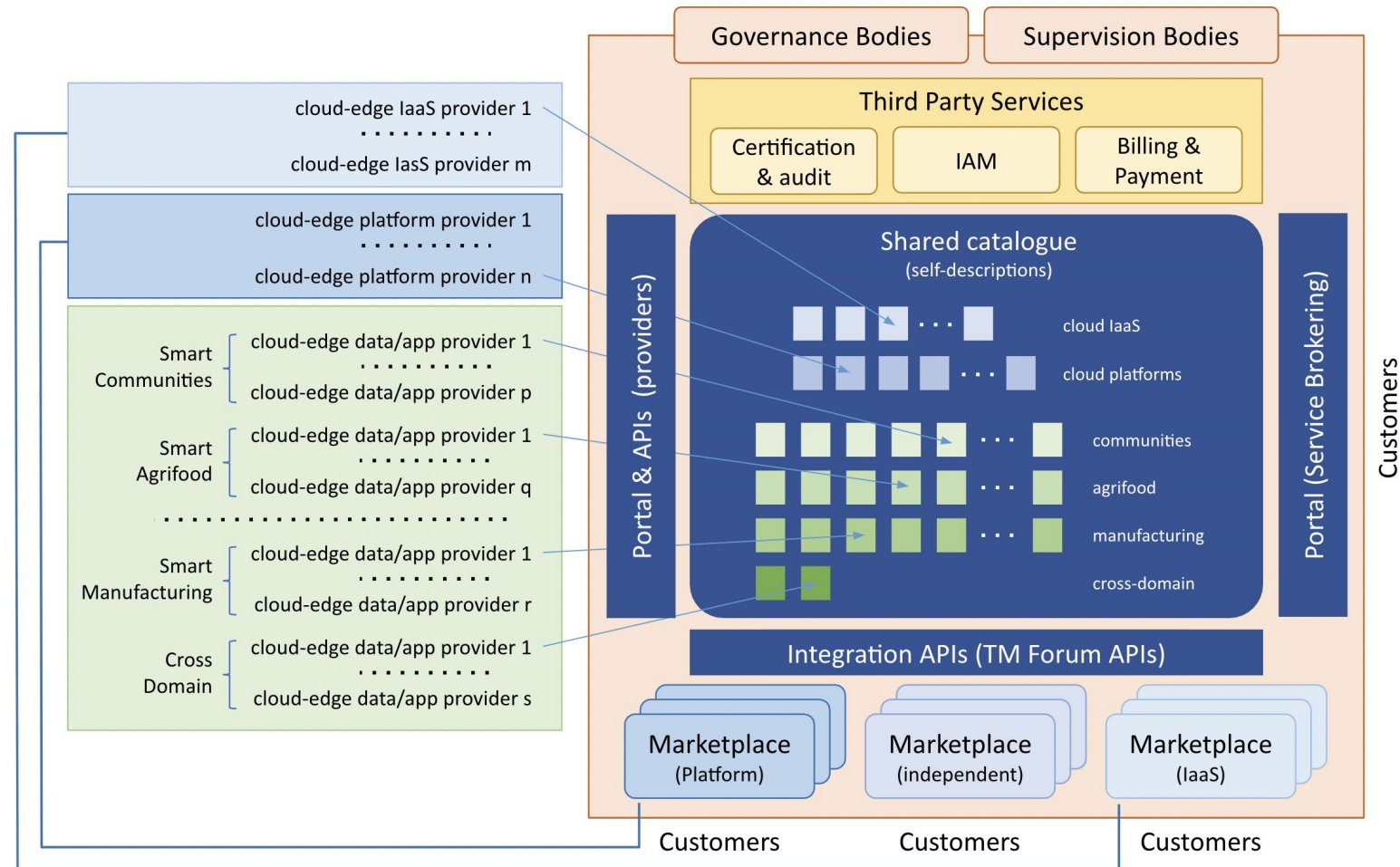
- Building Blocks (starting baselines):
  - Service Self-descriptions: [Gaia-X specifications](#)
  - Data Publication functions: [DCAT](#), [DCAT-AP](#)
  - Data Services Marketplace functions: [TM Forum APIs](#)
- Foreseen activities:
  - Follow up technical convergence activities within DSBA
  - Follow up evolution of DCAT/DCAT-AP and TM Forum specs
  - Integration of Data Publication and Data Service Marketplaces
  - Analysis of frameworks for metadata annotation and discovery
  - Inventory of open source products compliant with reference specs
- Collaboration with relevant projects/initiatives:
  - [Data Spaces Support Center](#) / DOME (Digital Europe Programme)
  - [Data Spaces Business Alliance \(DSBA\)](#) and associations
  - [TM Forum](#)
  - [Living-in.EU](#) / [OASC](#) (evolution of MIM-3)





# Marketplace and Service Catalogue federation in DOME

- Different kind of service providers:
  - IaaS providers
  - Platform service providers
  - Data/App service providers
- Access rights acquired via federated marketplaces relying on a Shared Catalogue of service & service offering descriptions:
  - formatted as Verifiable Credentials / Presentations (VC/VP) in compliance with Gaia-X specs
  - Shared Catalogue relying on electronic ledgers to allow decentralized storage and facilitate spreading of info to federated marketplaces
- Standard TM Forum APIs used:
  - by federated marketplaces to access service & service offering descriptions
  - to record logs during lifecycle of service orders and activation of services
  - to record logs during execution of services



# Future challenges

- Main FIWARE contribution to computing continuum comes from the open technology for distributed management of data (data spaces, cloud/edge marketplace)
- The vision papers and design principles (DSBA Technical Convergence, i.e.) are important but we need to perform a successful transfer to the market
- From data sharing/data spaces perspective, futures challenges for computing continuum agenda are:
  - Decentralized identity management, trust anchors and data access control across multi-providers in a deployment on a mixed cloud/edge/IoT infrastructure
  - Common and open standards for protocols (data exchange, network, communication, IoT...)
  - Traceability of data and usage accounting across the continuum
  - Federated catalogues with services/data from cloud, edge or IoT resources - publication and discovery in any of them
  - ... **all in an open, easy and efficient way**



#FIWARESUMMIT

# FIWARE Global Summit 2023

FIWARE  
Global  
Summit

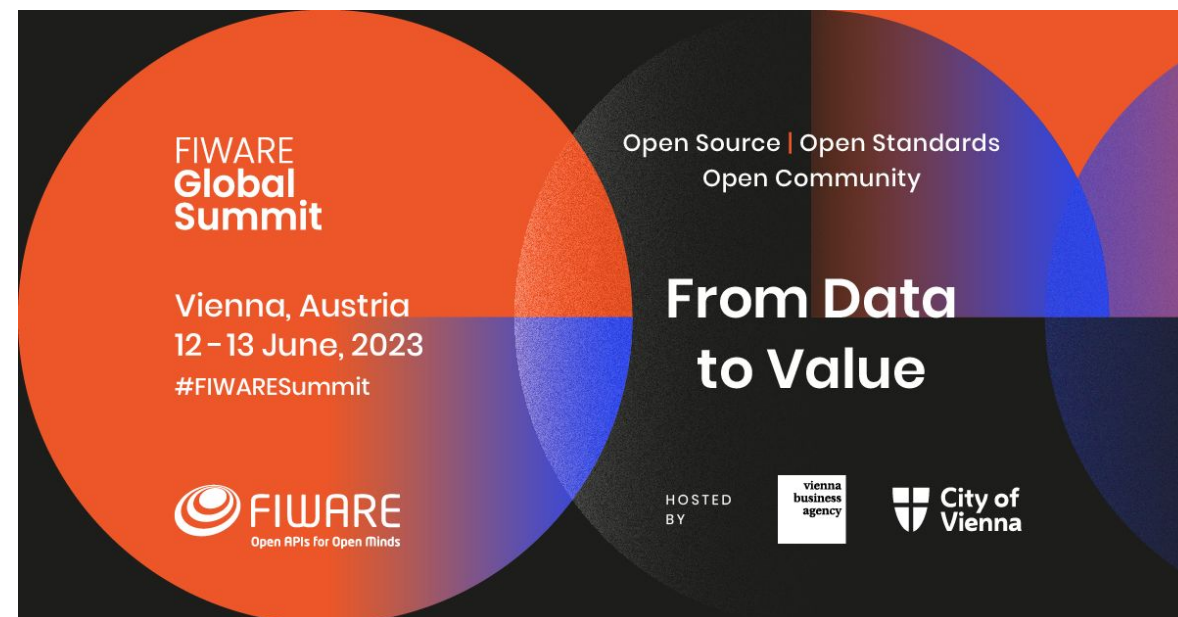
We are glad to invite you to the 9th FIWARE Global Summit in Vienna, Austria (12-13 June 2023) – one of the leading Open Source conferences for entrepreneurs, public administrations, academia, developers, start-ups, and technologists.

**Get ready for two days of world-class innovation, collaboration, and networking.**

Looking into joining the FIWARE community, our global ecosystem, or just interested in the impact and opportunities with Open Source technology? Then this Summit is made for you!

## Take a glimpse at some highlights of the Summit:

- Meet our fabulous Keynote speakers - **Yasser Alsaied**, Vice President of IoT, Amazon (AWS), **Sophie Proust**, CTO at Atos, **Dr. Jonathan Reichental**, Best-Selling Author, Founder and CEO Human Future, **Dr. Boris Otto**, Professor at TU Dortmund University and Executive Director at Fraunhofer ISST, to name but a few.
- Be among **500+ participants joining from all over the world, 150+ speakers, 300+ sessions**, presentations and panel discussions, and workshops.
- Benefit from a rich side program before and after the Summit. Don't miss **FIWARE Technical Training June 13-15** (separate free registration required on Eventbrite).



**Tickets are already on sale!**



# Thanks - Contact us!

<http://fiware.org>

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