gaia-x AMS

part of

gaia-x future mobility

Gaia-X Lighthouse Project

GX4FM

Funded by the European Union
NextGenerationEU

Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

AMS

Video about Gaia-X 4 AMS:
https://www.youtube.com/watch?v=FcJTAdI_n_A

gaia-x 4 AMS

Capgemini engineering

Fraunhofer

DLR Deutsches Zentrum für Luft- und Raumfahrt

peregrine.ai

ifak

consider it
CO-CREATING THE DIGITAL FUTURE

Technische Hochschule Ingolstadt

T-Systems

KROSCHKE

ELEKTRA SOLAR

Afusoft

software AG

zeppelin universität
zwischen
Wirtschaft Kultur Politik

Continental

TEC BERNARD
Advanced Technical Solutions

ZITiS

Feuerwehr Braunschweig

OECON

FGVT htw saar
Forschungsgruppe
Verkehrstelematik

Project Overview
Benefit of Gaia-X
ODD Compliant Routing
Onboarding Dataspace
Governance
Rescue Mobility
Drone Order & Flight (with SSI)
Drone Selection Service
Connection to Base-X
Contact

KEY OBJECTIVES

- Mastering demanding driving situations through the use of Gaia-X
- Integration of project-specific data services and data exchange in a data space
- Implementation of two field-based use cases

FACTS & FIGURES

Lead: T-Systems & DLR
Number of project participants: 19
Duration: 12/21 - 09/24
Total funding: € 20.79 million

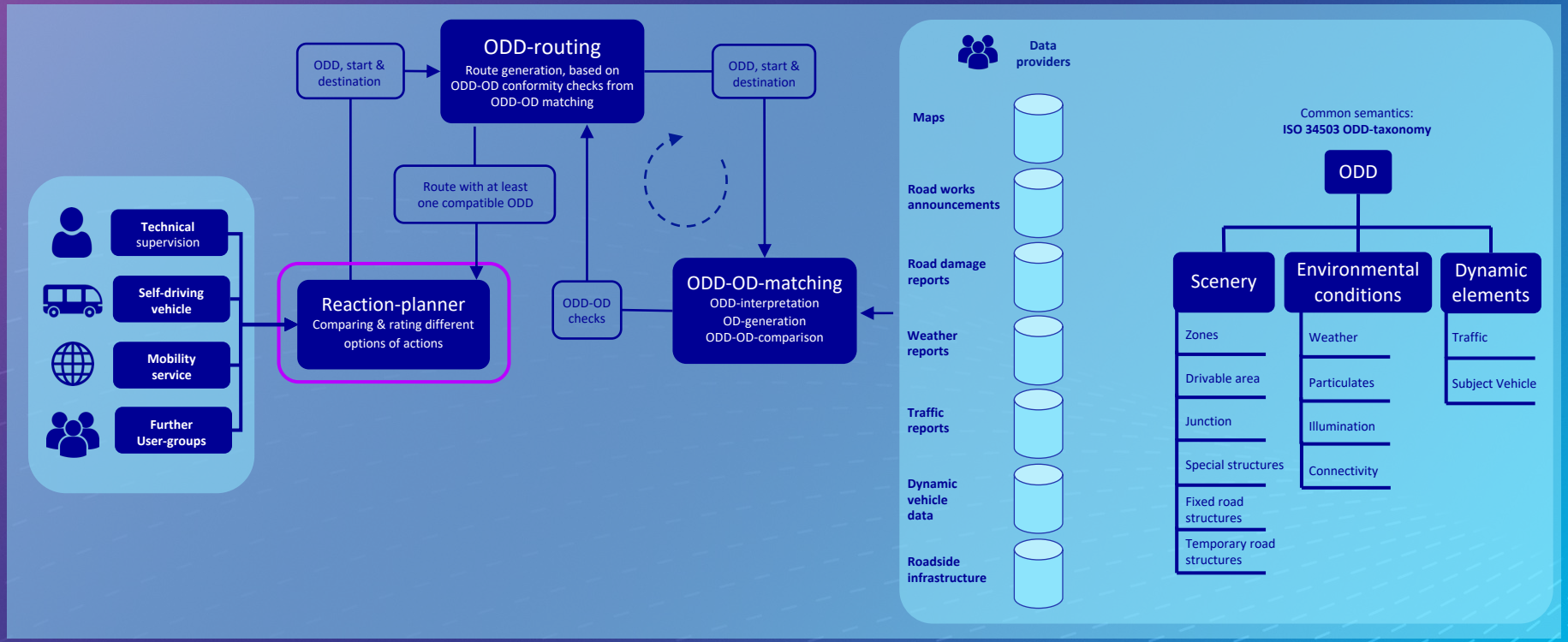
USE CASES

SAFE COORDINATION OF AUTONOMOUS VEHICLES

Providing information on infrastructure, traffic and vehicles to ensure the safe operation of automated vehicles

INTERCONNECTED AND SAFE RESCUE CORRIDOR

Creating a prototype of an interconnected rescue corridor that provides dynamic information and supports the safe journey of emergency vehicles.


ODD, start & destination
ODD-routing
Route generation, based on ODD-OD conformity checks from ODD-OD matching
ODD, start & destination
Route with at least one compatible ODD
Technical supervision
Self-driving vehicle
Mobility service
Further User-groups
Reaction-planner
Comparing & rating different options of actions
ODD-OD checks
ODD-OD-matching
ODD-interpretation
OD-generation
ODD-OD-comparison
Data providers
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Road works announcements
Road damage reports
Weather reports
Traffic reports
Dynamic vehicle data
Roadside infrastructure
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Environmental conditions
Dynamic elements
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Junction
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Particulates
Illumination
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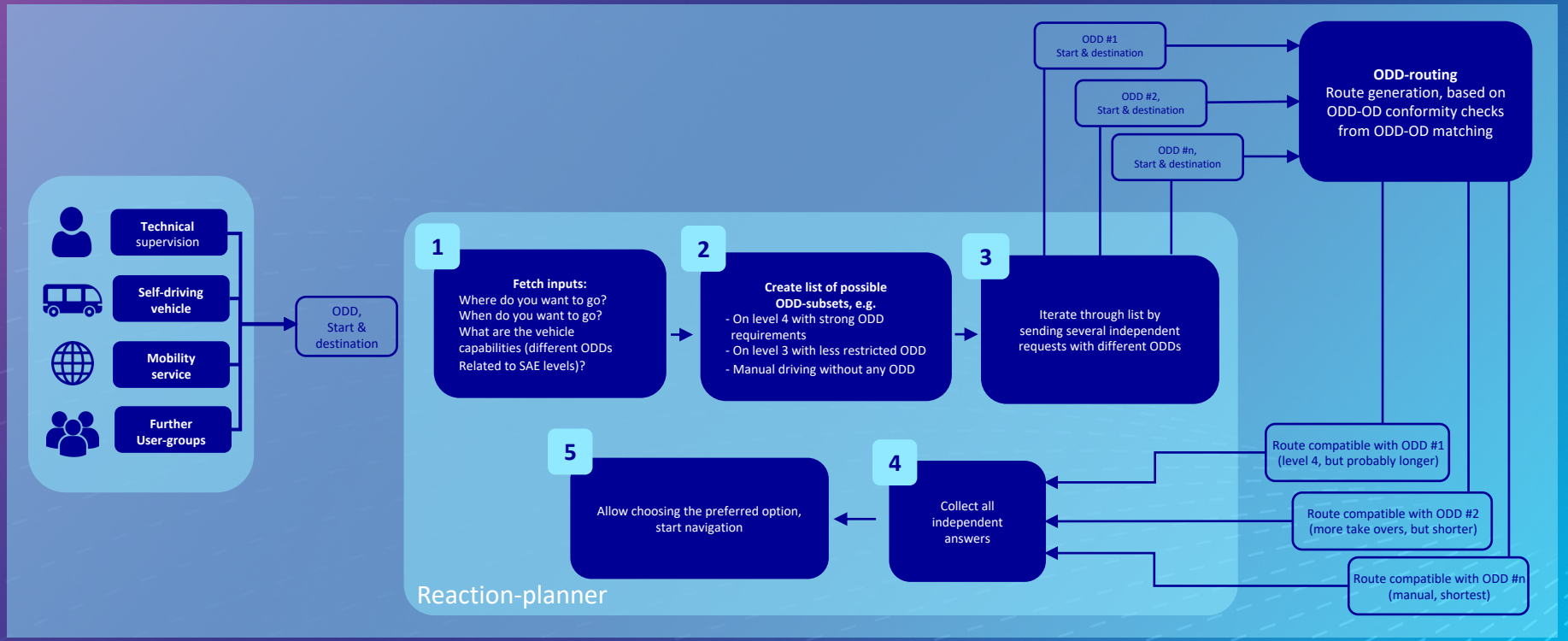
Subject Vehicle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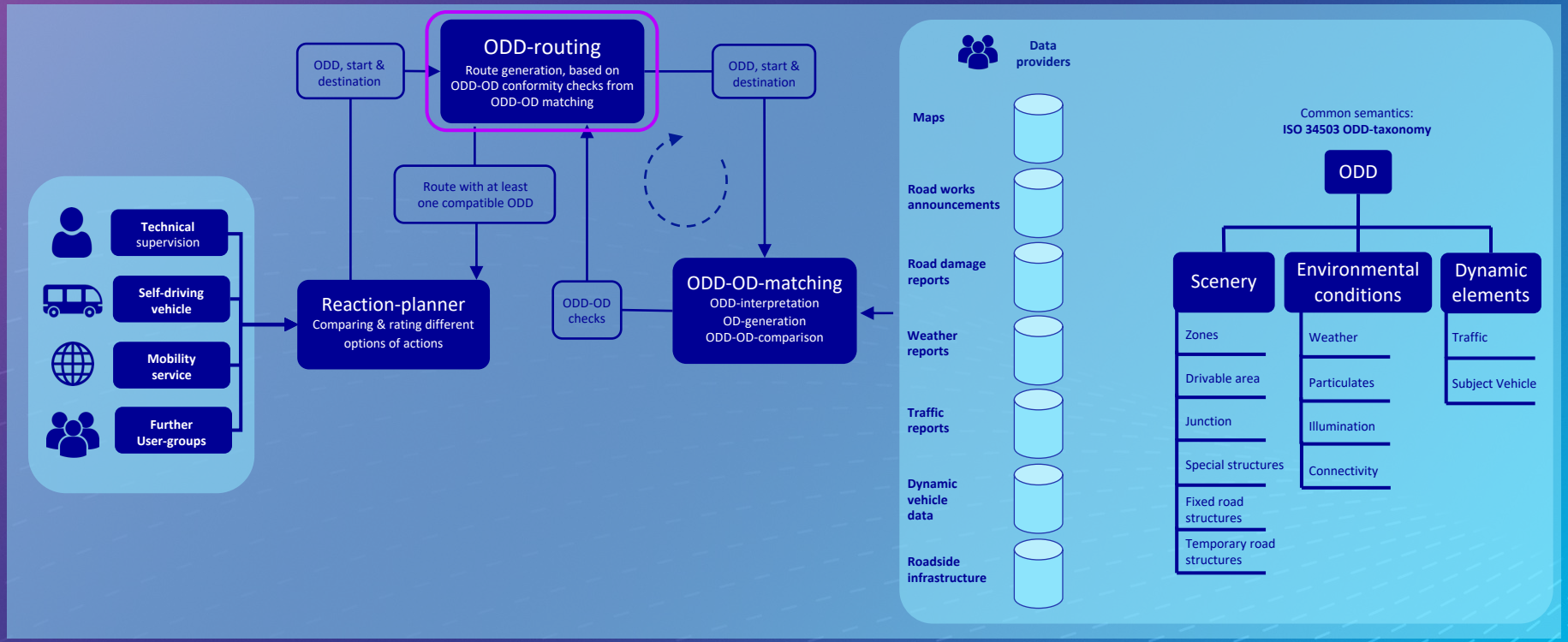
ODD, Start & destination
1
Fetch inputs:
Where do you want to go?
When do you want to go?
What are the vehicle capabilities (different ODDs Related to SAE levels)?
2
Create list of possible ODD-subsets, e.g.
- On level 4 with strong ODD requirements
- On level 3 with less restricted ODD
- Manual driving without any ODD
3
Iterate through list by sending several independent requests with different ODDs
ODD #1 Start & destination
ODD #2, Start & destination
ODD #n, Start & destination
ODD-routing
Route generation, based on ODD-OD conformity checks from ODD-OD matching
4
Collect all independent answers
Route compatible with ODD #1 (level 4, but probably longer)
Route compatible with ODD #2 (more take overs, but shorter)
Route compatible with ODD #n (manual, shortest)
5
Allow choosing the preferred option, start navigation
Reaction-planner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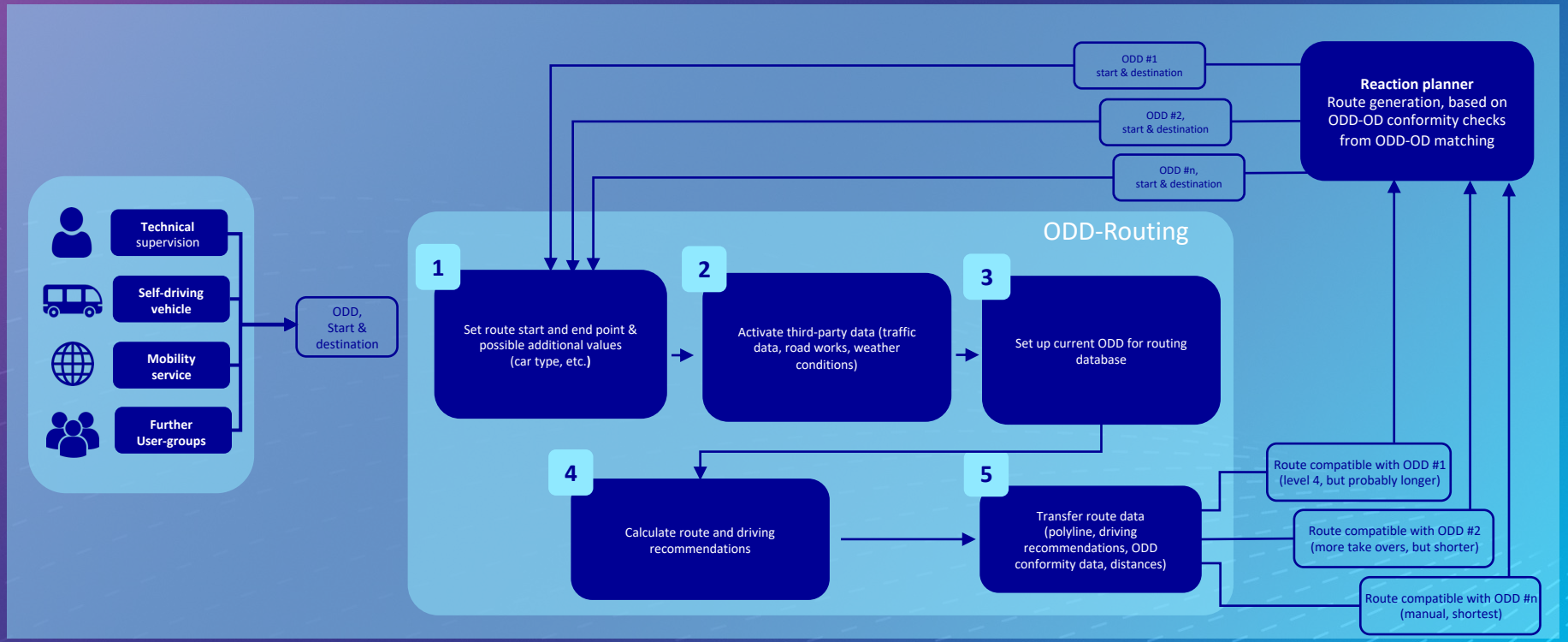
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ODD, Start & destination
ODD-Routing
1
Set route start and end point & possible additional values (car type, etc.)
2
Activate third-party data (traffic data, road works, weather conditions)
3
Set up current ODD for routing database
4
Calculate route and driving recommendations
5
Transfer route data (polyline, driving recommendations, ODD conformity data, distances)
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ODD #2, start & destination
ODD #n, start & destination
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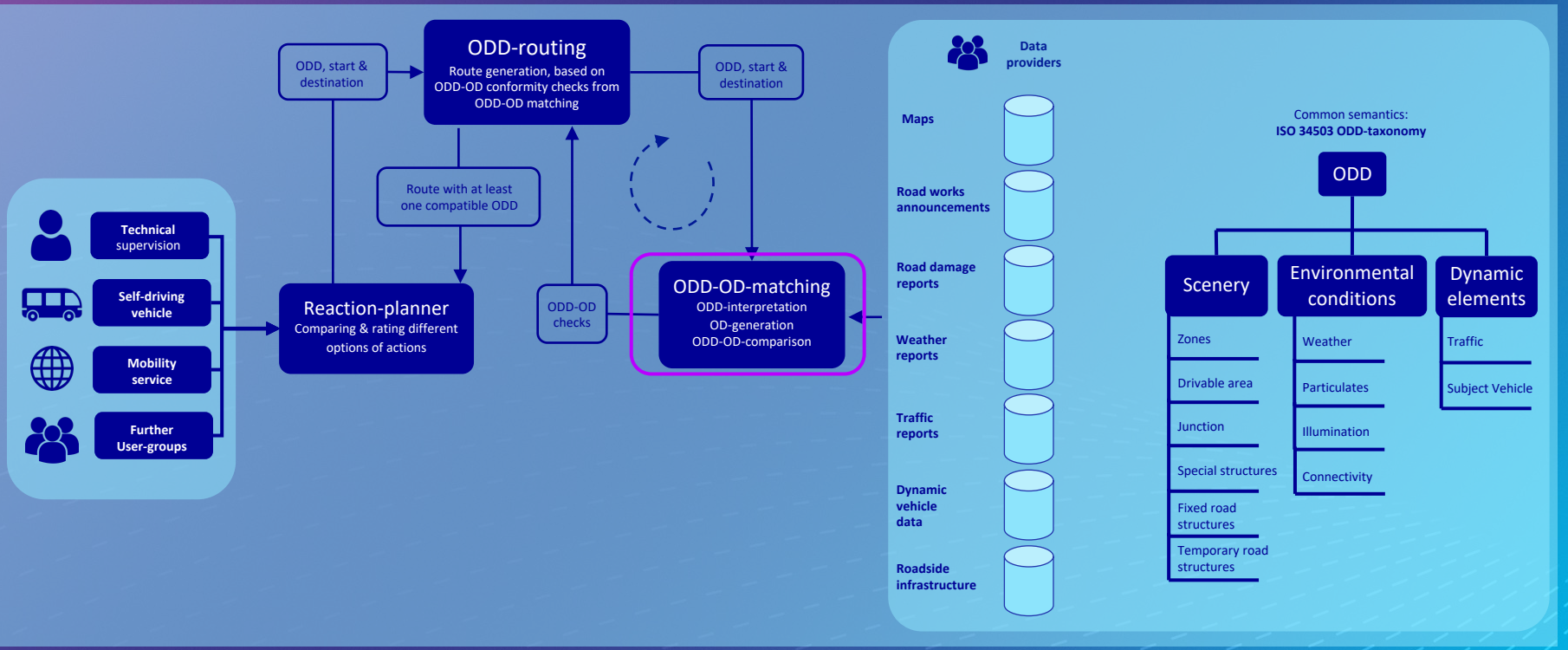
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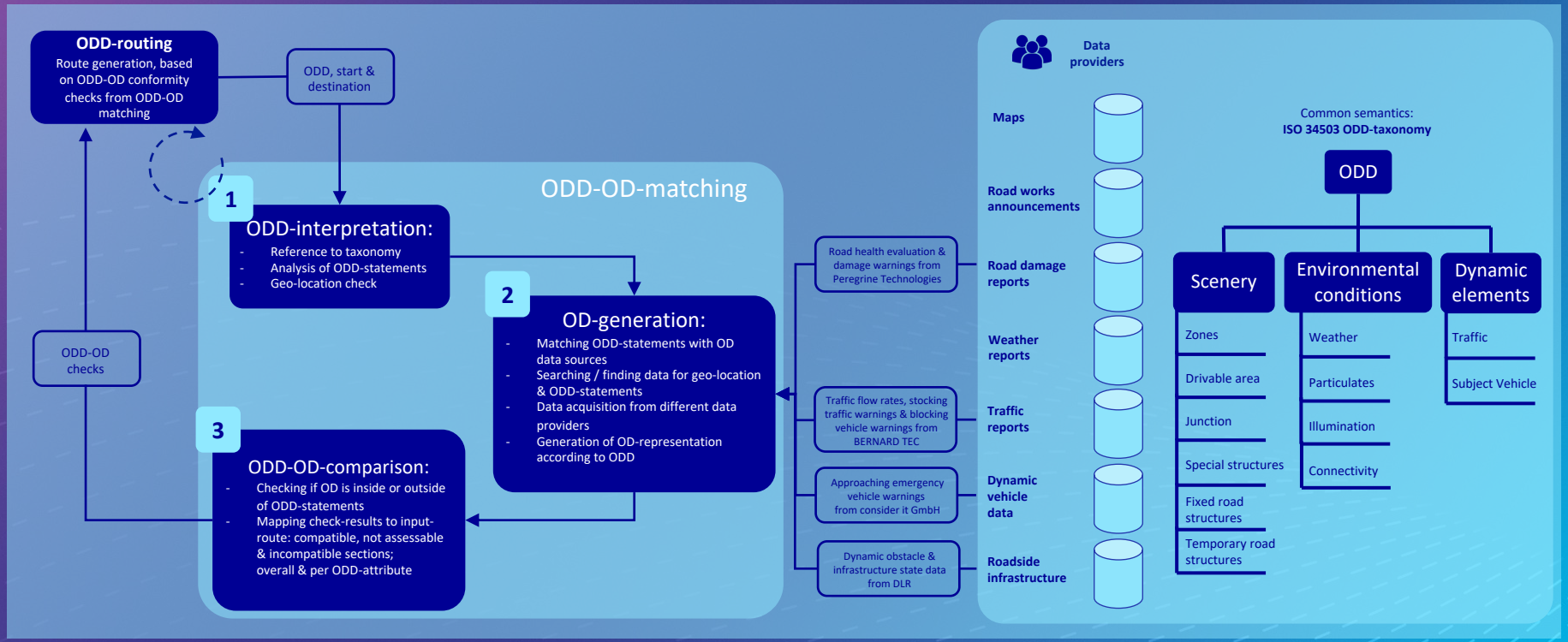
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ODD-interpretation:
- Reference to taxonomy
- Analysis of ODD-statements
- Geo-location check
2
OD-generation:
- Matching ODD-statements with OD data sources
- Searching / finding data for geo-location & ODD-statements
- Data acquisition from different data providers
- Generation of OD-representation according to ODD
3
ODD-OD-comparison:
- Checking if OD is inside or outside of ODD-statements
- Mapping check-results to input-route: compatible, not assessable & incompatible sections; overall & per ODD-attribute
Road health evaluation & damage warnings from Peregrine Technologies
Traffic flow rates, stocking traffic warnings & blocking vehicle warnings from BERNARD TEC
Approaching emergency vehicle warnings from consider it GmbH
Dynamic obstacle & infrastructure state data from DLR
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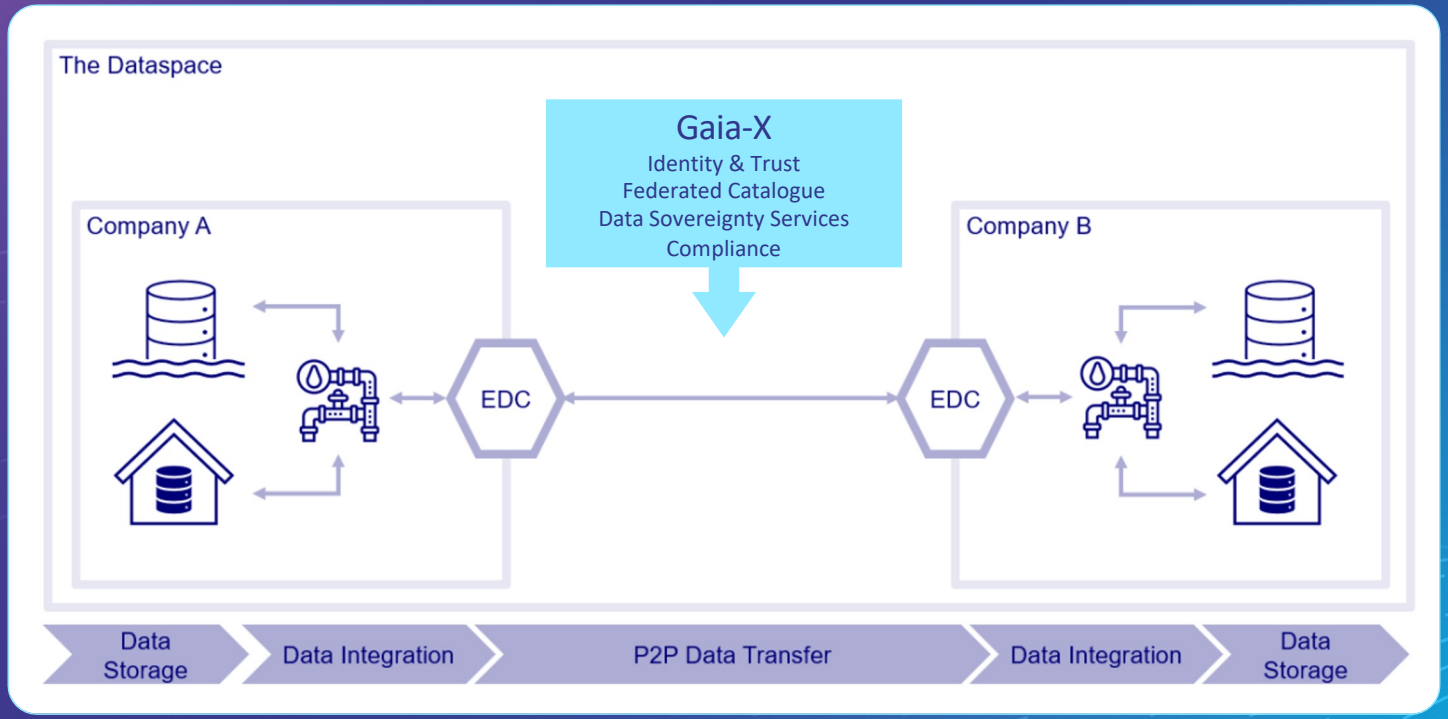

The Dataspace
Gaia-X
Identity & Trust
Federated Catalogue
Data Sovereignty Services
Compliance
Company A
Company B
EDC
EDC
Data Storage
Data Integration
P2P Data Transfer
Data Integration
Data Storage

Trust – main building block in digital world

Digital validation and verification: digital proofs of identity, membership, compliance, etc.

Self-Sovereign Identity (SSI)

Sovereignty assurance: full control over data and identity information.

Importance of Standards

Usage of standards improves the market acceptance and interoperability.

Digital Identities

What once had to be verified in person, can now be verified digitally.

Decentralized Solution

Self-management without depending on third-party providers.

Implemented Standards:

- W3C Decentralized Identifiers
- W3C Verifiable Credentials
- Gaia-X Trust Framework 22.10
- eIDAS

gaia-x

Digital identity verification ensures trust in dataspaces

Trust, but verify!

- Secure digital identities for organizations & machines
- Reduces overall business risks & increases consumer confidence through reliability of trust chains
- Boosts operational efficiency through automation
- Proof of authenticity and origin of digital assets
- Ensures regulatory compliance, e.g., GDPR, eIDAS
- Creates long-term business relationships built on trust

Trusted Data Sources

- **VAT ID:** for the European member states or North Ireland, the VAT Information Exchange System (VIES)
- **EORI:** registration and identification of economic operators in the European Union
- **LEI Code:** the Global Legal Entity Identifier (GLEIF) with worldwide coverage
- **Local Commercial Registration Number**

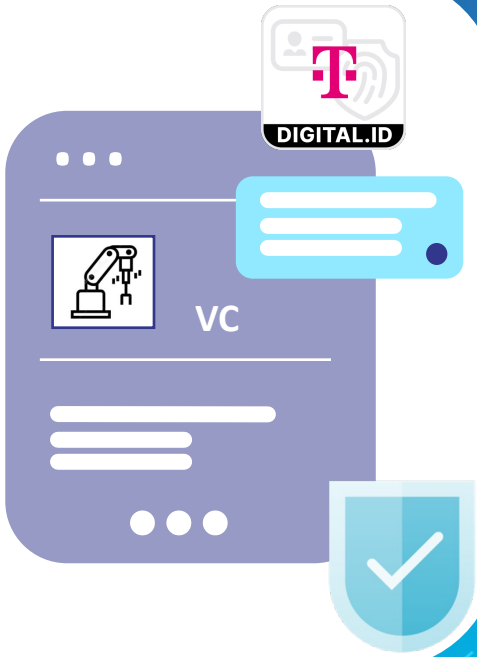
Validation Service: validation of companies' legal commercial registration numbers & European financial transaction identifiers

Gaia-X Compliance Service: validates the shape, content and credentials of self-descriptions attesting the result of the Gaia-X compliance proof

Notarization Service: adds eIDAS conform digital signature by Telekom Security

Gaia-X Registry Service:
list of valid shapes, as well as valid and revoked public keys

Business Reporting Service: reporting of successful and rejected validations

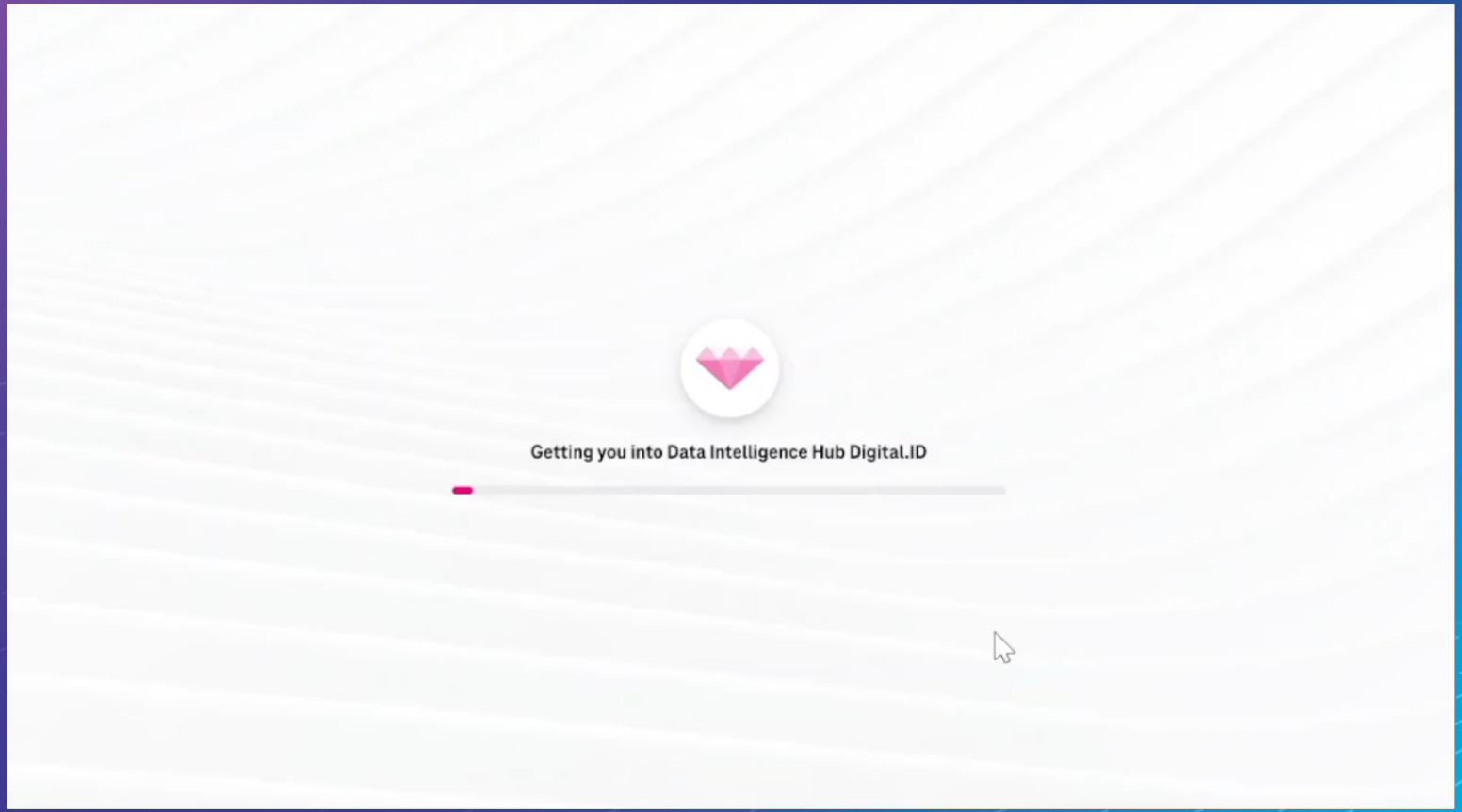


Digital.ID and GXDCH Node

- **Verification node of the Gaia-X rules** and the go-to place for Gaia-X compliance
- **Node operated by T-Systems**, acting as Gaia-X Trust Anchor
- Operate and run **services of the Gaia-X Framework** (compulsory and optional), to achieve compliance and support the onboarding of any Gaia-X adopter
- **Integrate to external** Conformance Assessment Bodies for external asseverations, Identity Verification, and other Trusted Data Sources as defined by the Gaia-X AISBL

Notarization API

- Authenticates master data and converts it into **verifiable W3C format**
- Establishes **trust through tamper-proof digital assertions** for accurate self-descriptions


Getting you into Data Intelligence Hub Digital.ID

DIGITAL.ID

Trustful

T-Systems' **independent** and **secure** global network entrusted with the GXDCH house node in Europe

Interactive

Highly **intuitive** easy-to-use **UI** for **credential holder** in **recipient & credential lifecycle management**

+

Wallet Agnostic

Bring your own wallet or use our solution

Interoperable

Take your identities to other data-driven ecosystems for complete **interoperability (data mesh)**

+

Intelligent

Based on custom parameters to allocate different **trust-levels** across dataspace participants

Conform

- **Gaia-X** or **Custom** compliant
- **JWT** conform
- **eIDAS** conform

eIDAS gaia-x

SME

Medium -Enterprise

Large -Enterprise

1st commercial product of GXDCH

The three Pillars of the AMS Governance

Minimum Requirements for the construction and participation in the Gaia-X ecosystem:

Basic Level of

- Interoperability
- Data Sovereignty

Organizational Structure

- Role Definition
- Role Assignment
- IRM Parameterization

Additional Regulations at the Federation and Use-Case level:

- Business Framework Conditions
- Regulation of Process Flows and Value Creation for successful Collaboration

Roles in the Gaia-X 4AMS Ecosystem

Gaia-X 4AMS emphasizes diverse, clearly defined 28 roles (clustered into 8 meta roles) to create an efficient data space.
It allows participants to assume multiple roles in any combination, promoting broad participation and enhancing the ecosystem by enabling multiple entities to fulfill the same roles.

System Management
- Governance
- Transaction Management
- Compliance

System Core
- System Federator
- System participant

System Basic Functions
- Marketing & Sales
- Communication
- Legal Consultation
- Portfolio Management

System Services
- Portal & Integration
- Dataspace Connector
- Data Sovereignity
- Service Catalogue
- Identity & Trust
- Conformity & Onboarding

Data Management
- Data Owner
- Consulting
- Service Owner
- Forensic Service Management
- Mapping management

Data Tethering
- Advanced Data Services
- Advanced Mobility Services

Infrastructure Management
- Mobile Devices Operator
- Incident Response Management
- Roadwork Management
- Lead Centre Management

Infrastructure Tethering
- Hosting Infrastructure
- Communication Infrastructure
- Traffic Infrastructure
- Traffic Participants

Role Assignment with the Institutional Role Model

Status Quo Analysis

Inventory of the current organizational and cooperation structure. Identification of relevant actors, institutions, and roles.

Requirements Analysis

Identification and definition of relevant institutions and roles for a resource-efficient organizational structure.

Matrix Evaluation

Evaluation of competence and trust identification using a matrix-based assessment method, taking into account temporal dimensions

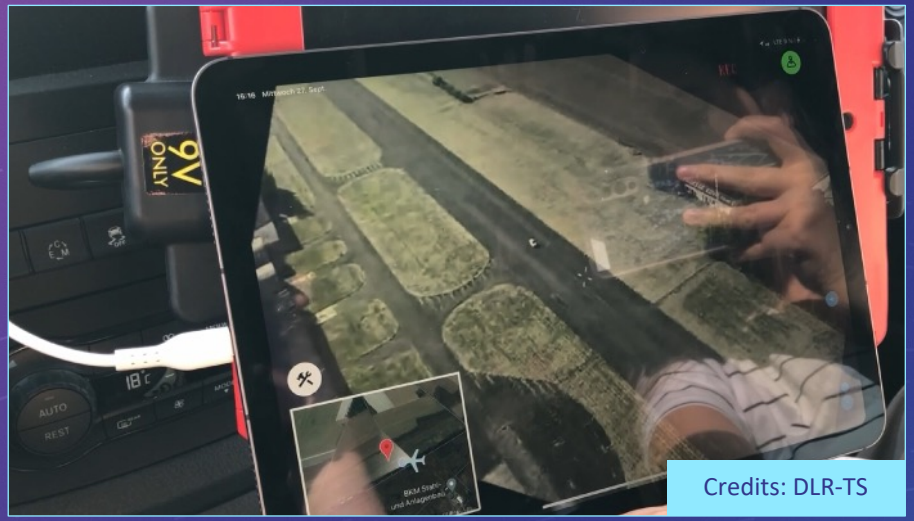
Simulation

Application of the algorithm for demand-oriented resource allocation with a concept for the implementation of added value

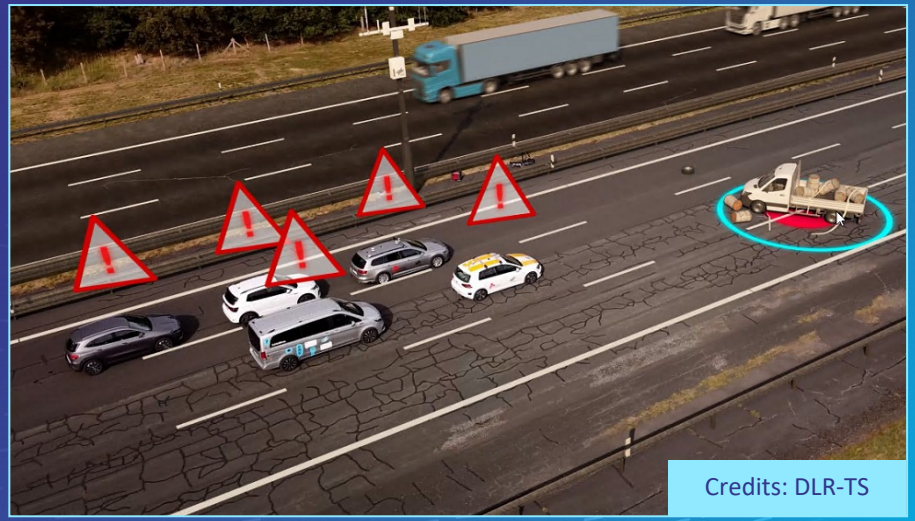
Results

Specific role assignments with an optimal outcome

Use Cases of Rescue Mobility



Pre-flight and reconnaissance of the situation for larger operations using drones



Construction site and warning service with GAIA-X connection

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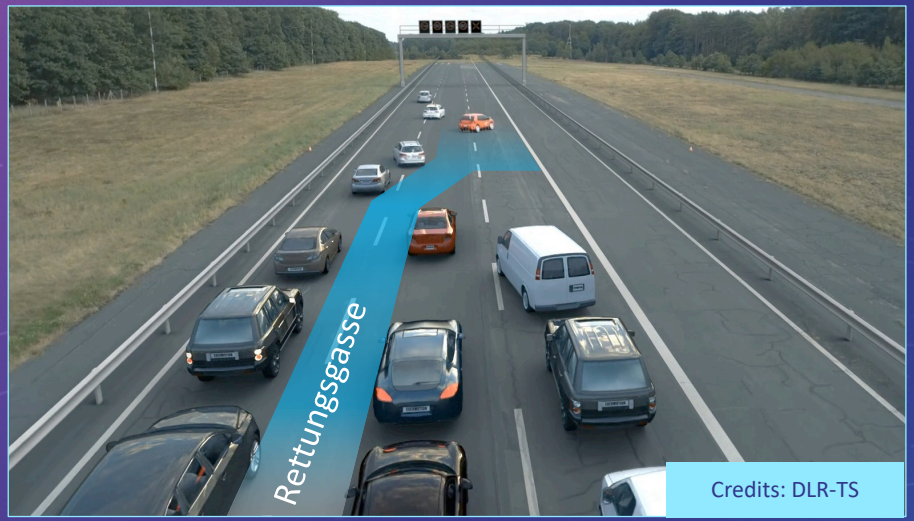
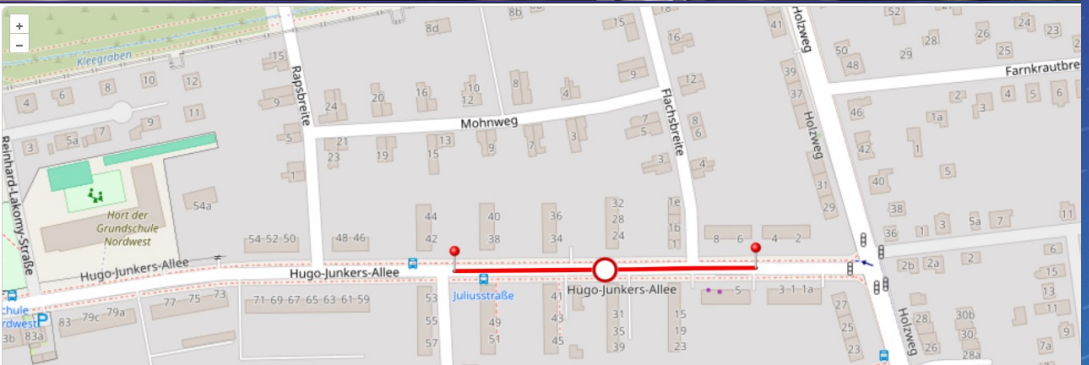


Credits: DLR-TS

Emergency lane service for automated and connected vehicles

Maxiphoto / Getty Image

Forensic approaches within GAIA-X



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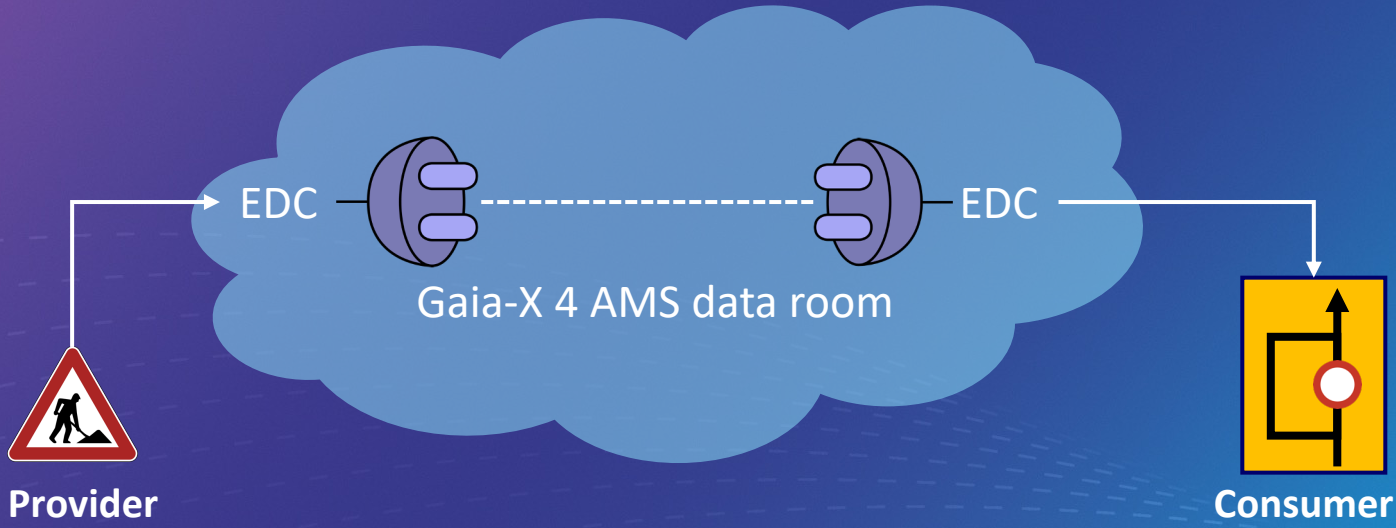
Construction sites

- Data available from many different sources
- Integration into the Gaia-X data room brings added value, e.g. for autonomous driving

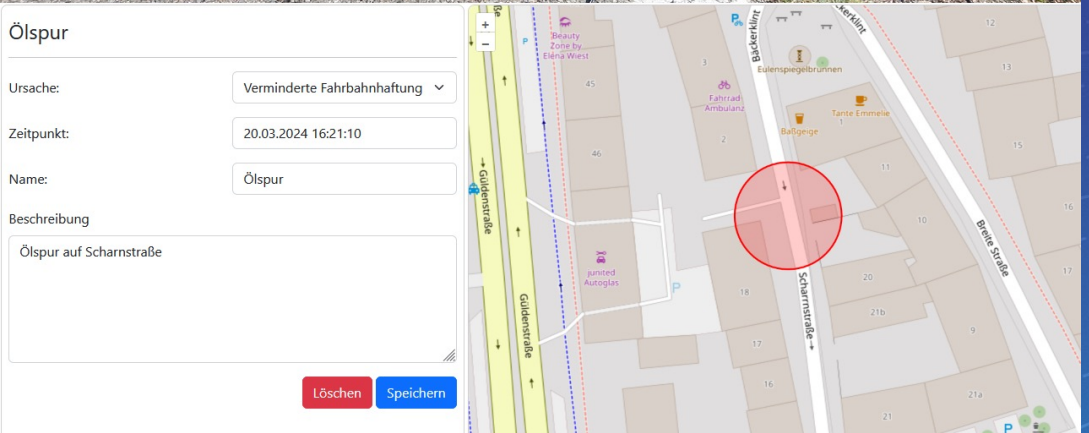


Provider

Provide construction site information via Gaia-X-compliant EDC connector

Consumer

Receive construction site information via Gaia-X-compliant EDC connector and take it into account in routing for autonomous vehicles



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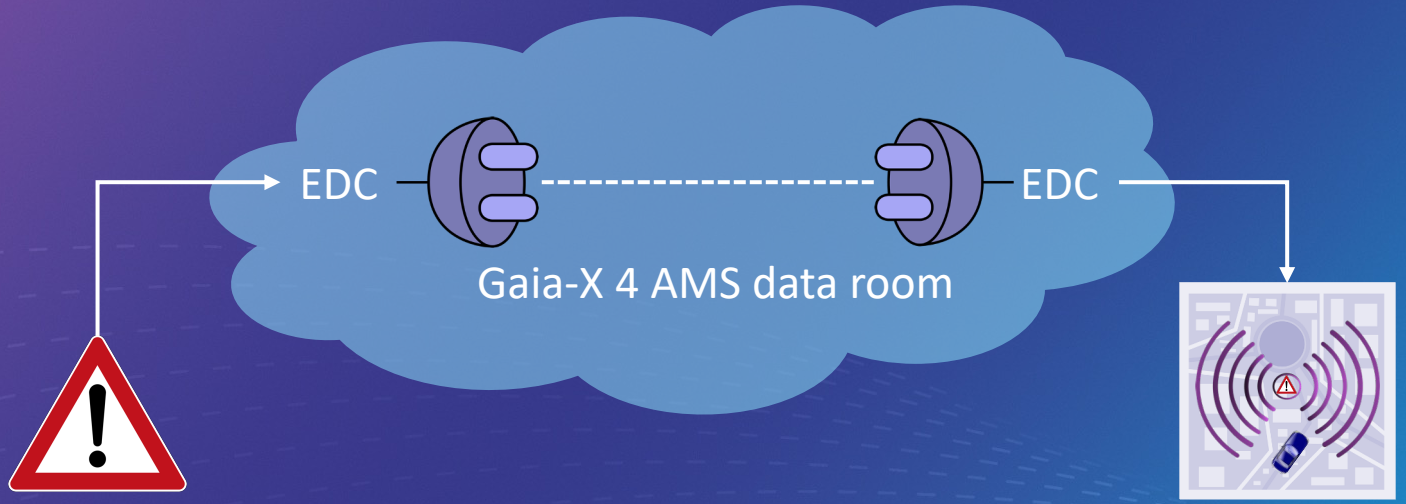
Warning messages

- Short-term traffic disruption, e.g. oil spill
- Entry via web application, e.g. by the fire department or traffic control center
- Integration into the Gaia-X data room
- Data can be used to warn other road users via V2X



Provider

Provide warning messages via Gaia-X-compliant EDC connector

Consumer

Receive warning messages via Gaia-X-compliant EDC connector and send them to vehicles via V2X

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Corridor for emergency Vehicles

- **Incoming information on planned trajectory of emergency vehicle**
- Perception of environment
- Trajectory planning to provide suitable space to the emergency vehicle
- Autonomous movement to the roadside

gaia-x AMS

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gaia-x AMS

Corridor for emergency Vehicles

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- **Trajectory planning to provide suitable space to the emergency vehicle**
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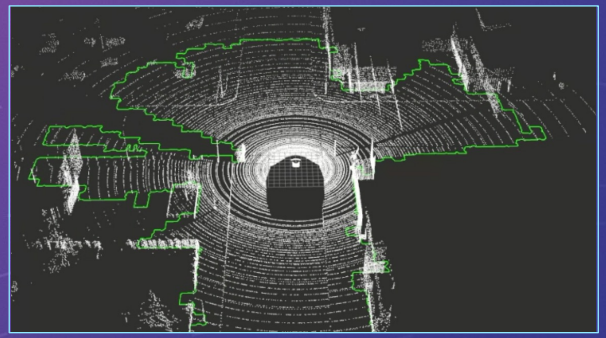
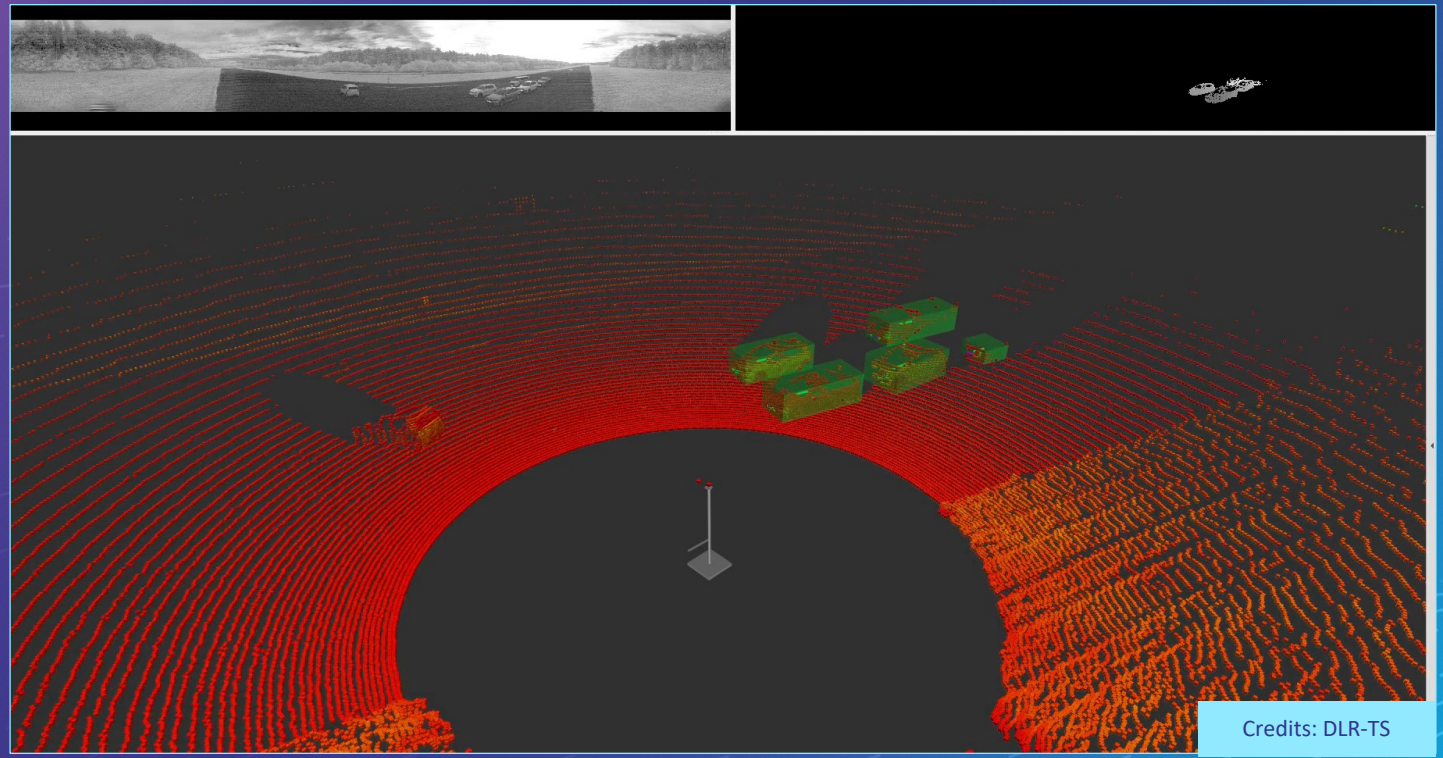
Perception Modules



Perception of the environment with awareness of free space allowing movement

Trajectory planning in awareness of environment

Capability to autonomously control the vehicle to clear the path for the emergency vehicle



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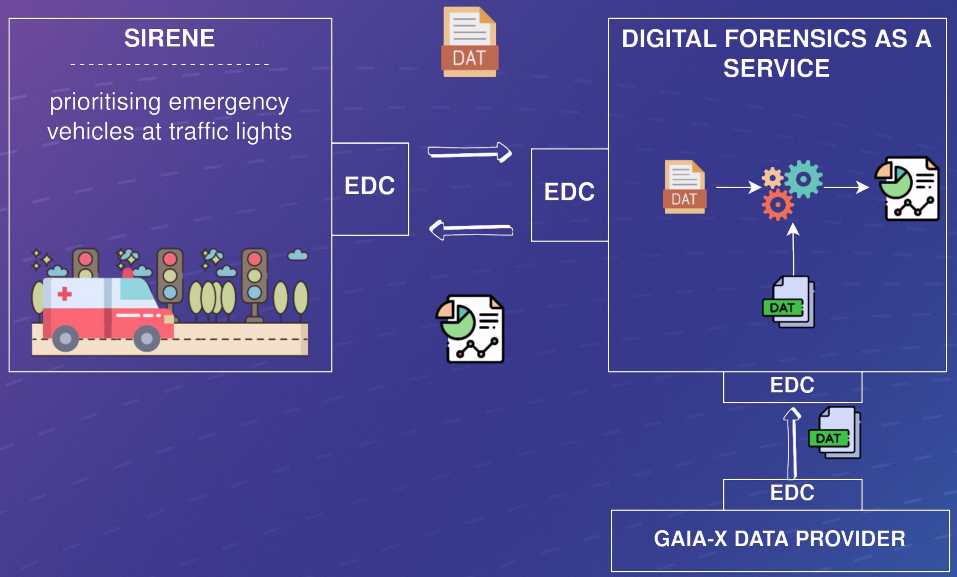
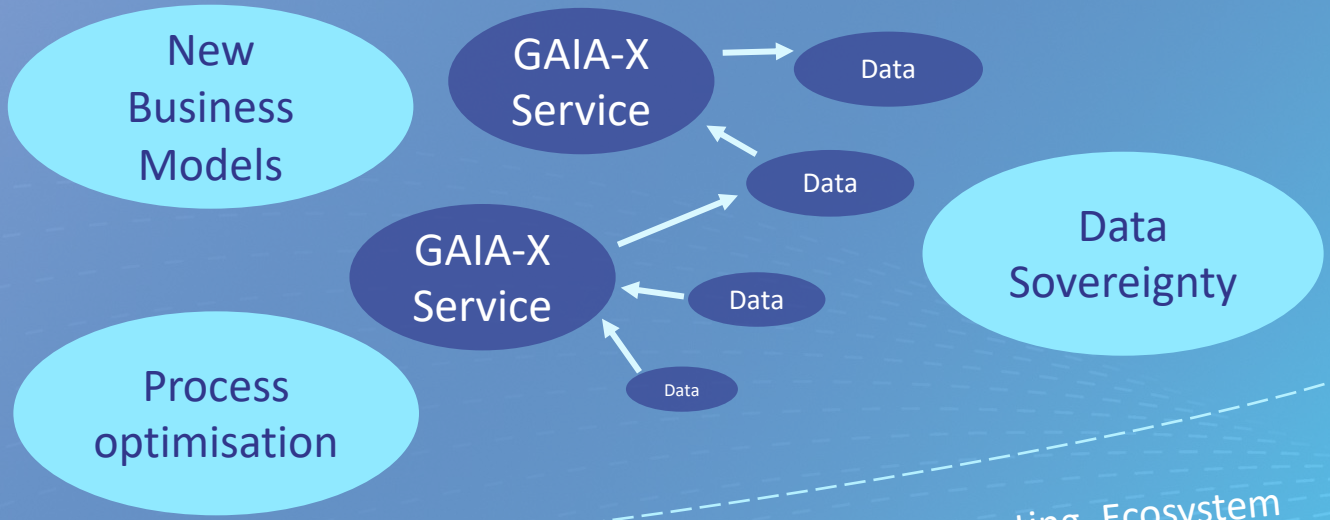
Digital Forensic aaS



- SIRENE capable of controlling traffic lights
  - To activate green waves for emergency vehilces
- To detect misuse, system is connected to a Digital Forensic Service
- Digital Forensic as a Service
  - Receives and analyses Data and returns results via EDC
  - SIRENE Data can be enriched with data from other data providers

Benefits for the rescue mobility use case through GAIA-X



How can we ensure that **providers** and **users** find each other **worldwide** in accordance with **European standards** to generate **business immediately**?

gaia-x AMS

With Gaia-X Credentials

based on SSI

- Digital evidence directly into the leading system
- Digital rights for direct use in the chosen ecosystem
- Transfer all information digitally to customers

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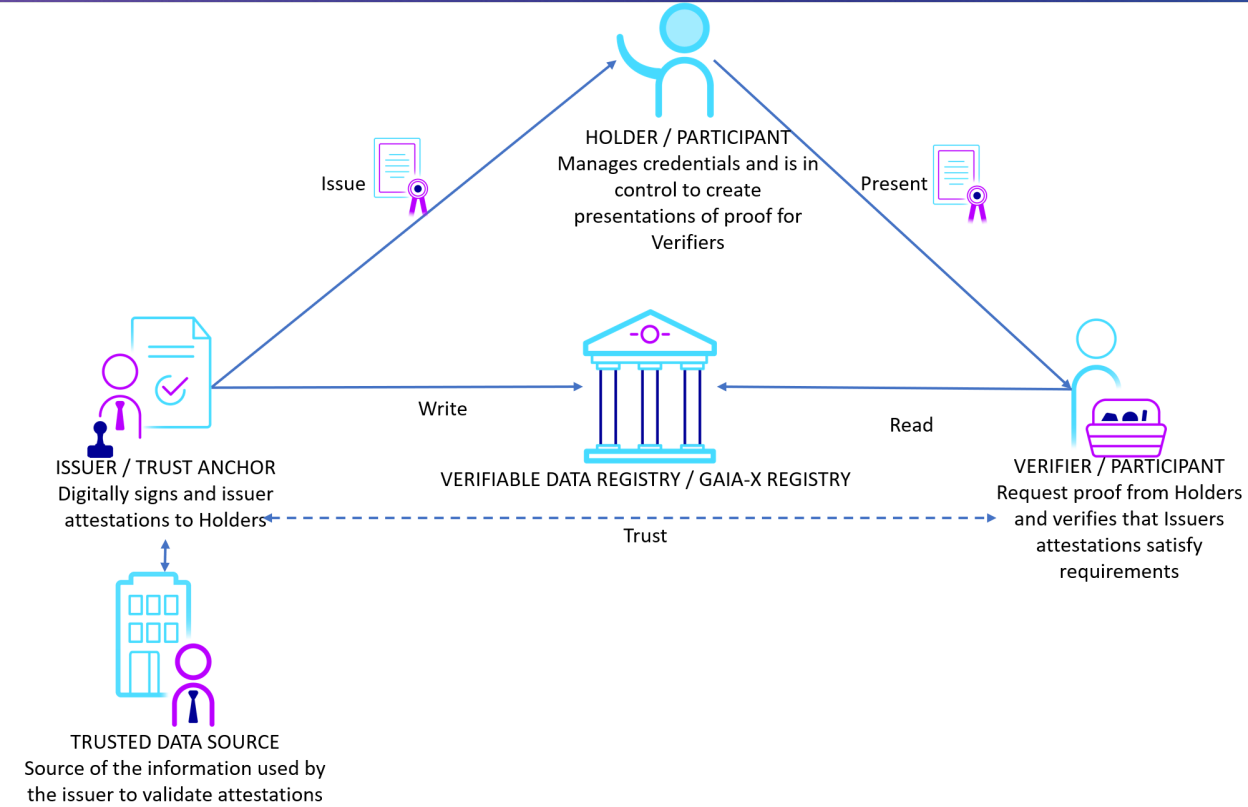
SSI at a Glance

- ✓ Identification through Digital Identities
- ✓ Digital Credentials (Verifiable Credentials)
- ✓ Data sovereignty
- ✓ Data storage at the user
- ✓ Based on credentials

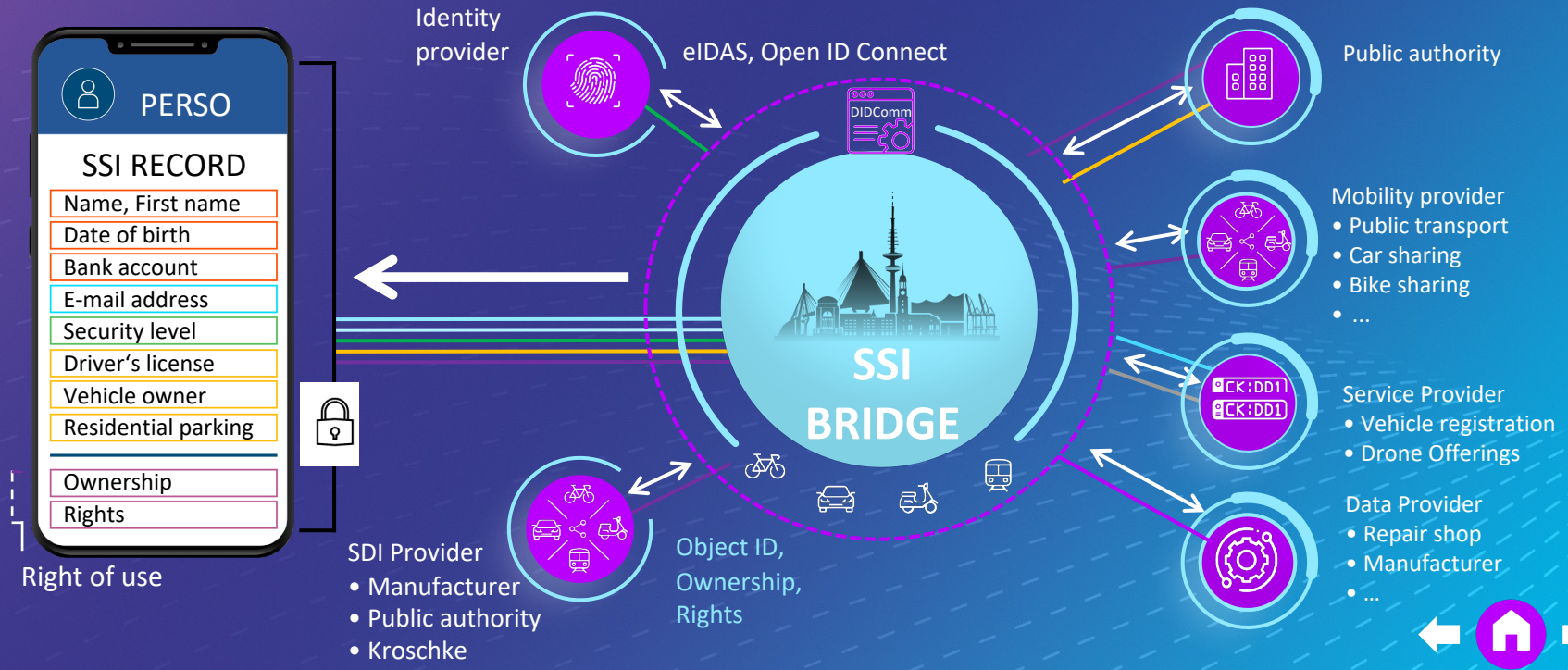
SSI at a Glance

Securely proof individual rights / information completely digital to third parties.


HOLDER / PARTICIPANT
Manages credentials and is in control to create presentations of proof for Verifiers
Issue
Present
Write
Read
ISSUER / TRUST ANCHOR
Digitally signs and issuer attestations to Holders
VERIFIABLE DATA REGISTRY / GAIA-X REGISTRY
VERIFIER / PARTICIPANT
Request proof from Holders and verifies that Issuers attestations satisfy requirements
Trust
TRUSTED DATA SOURCE
Source of the information used by the issuer to validate attestations

The Provided Digital Identities

enables all participants to digitally implement their processes.



Time for a demonstration!

Fire Department

gaia-x

Drone Provider

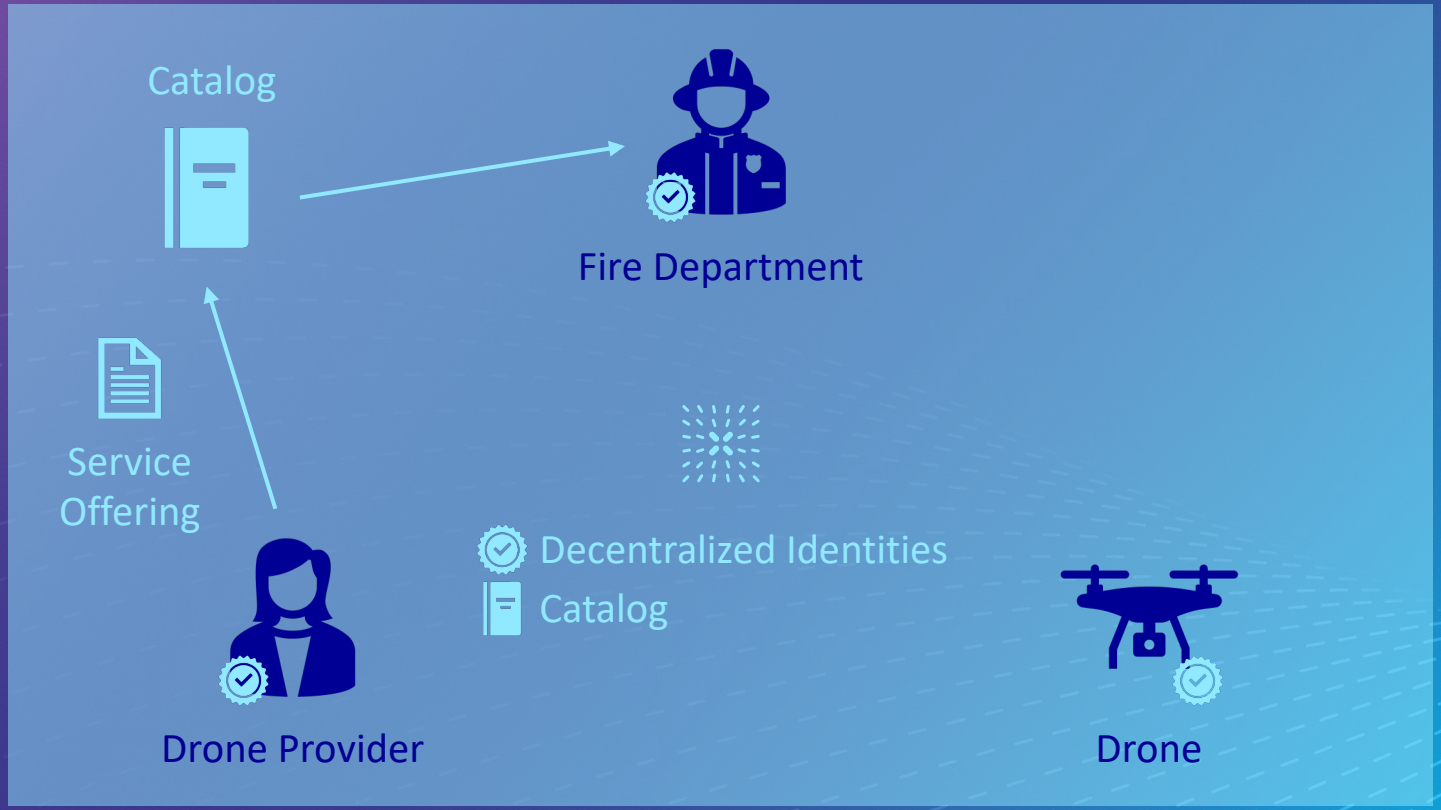
Drone

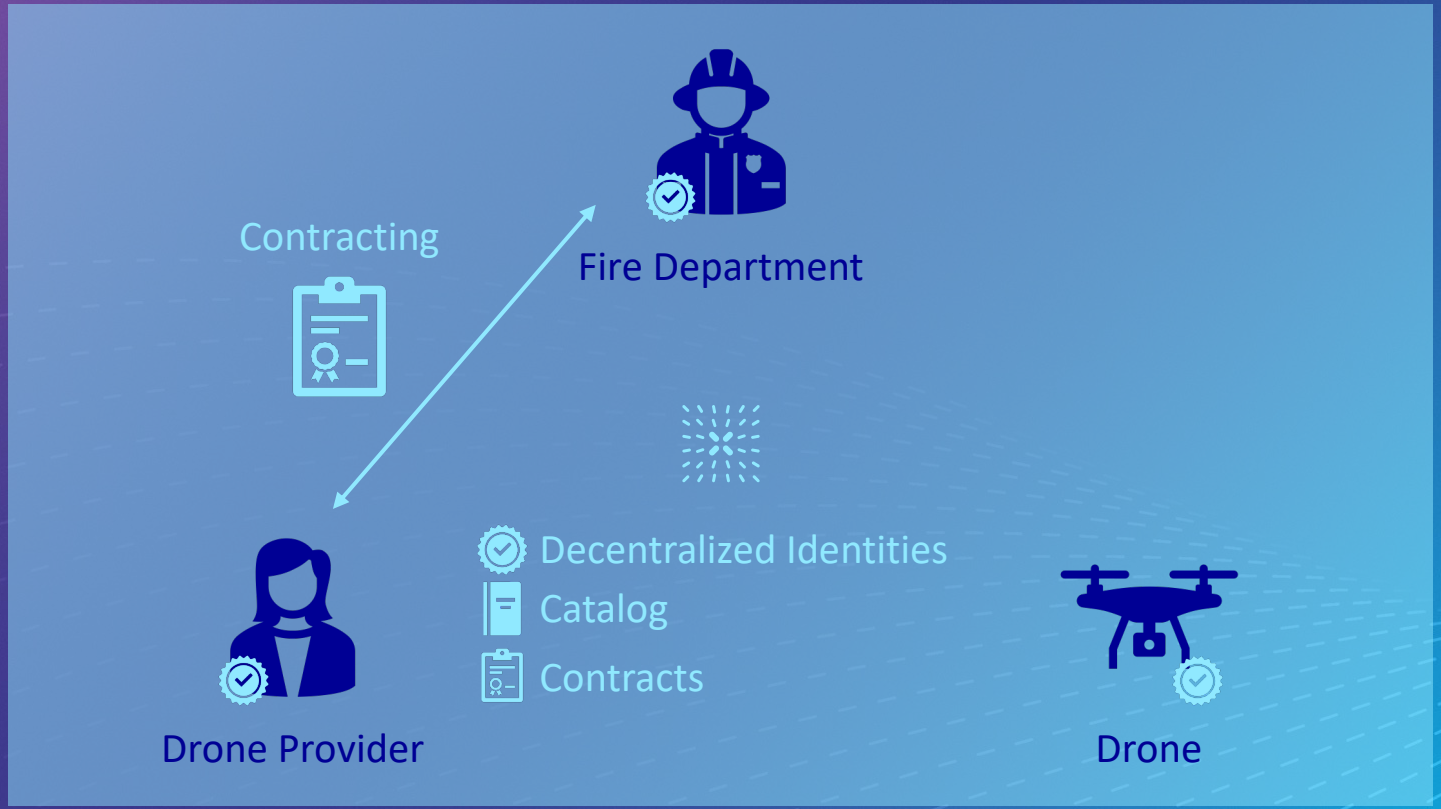
Fire Department

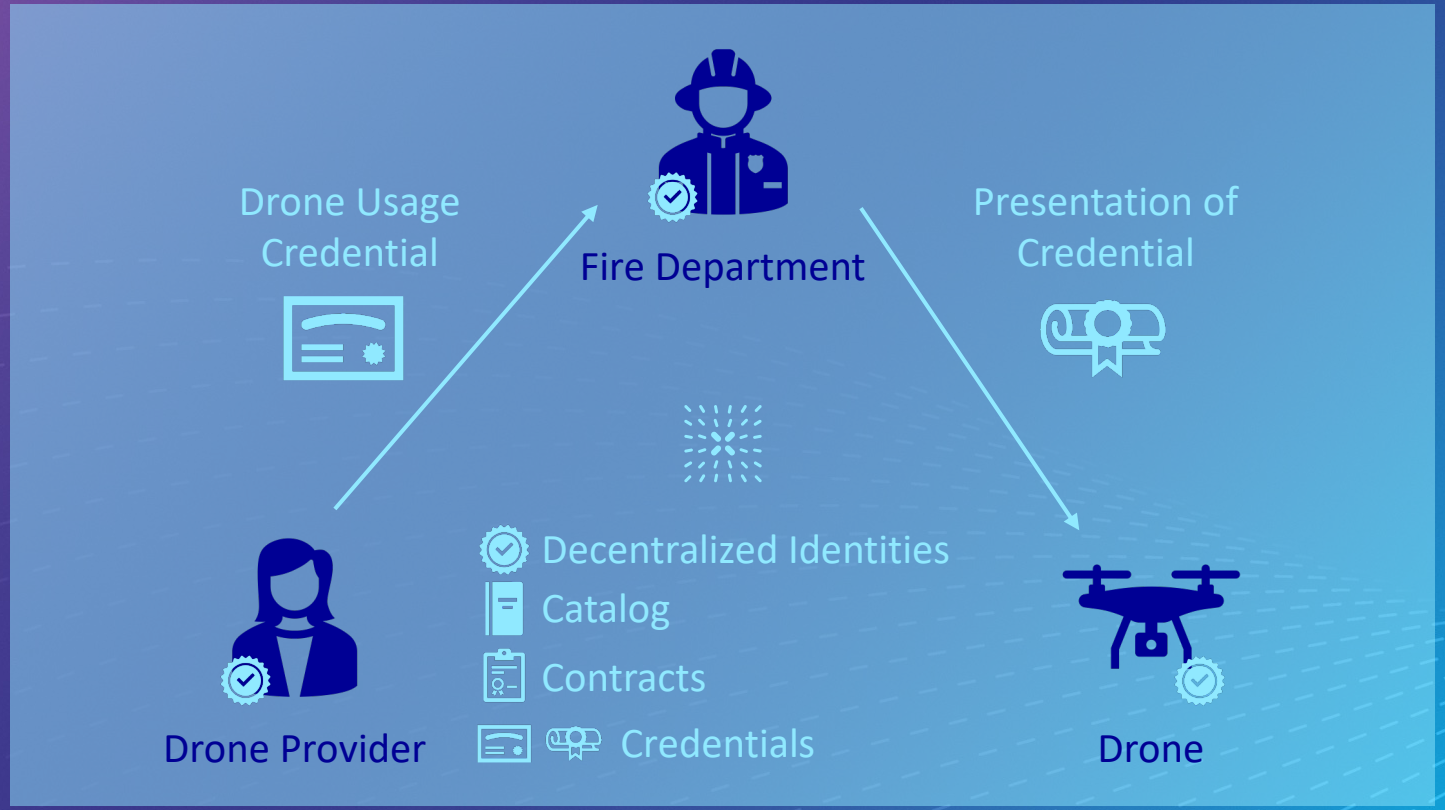
Decentralized Identities

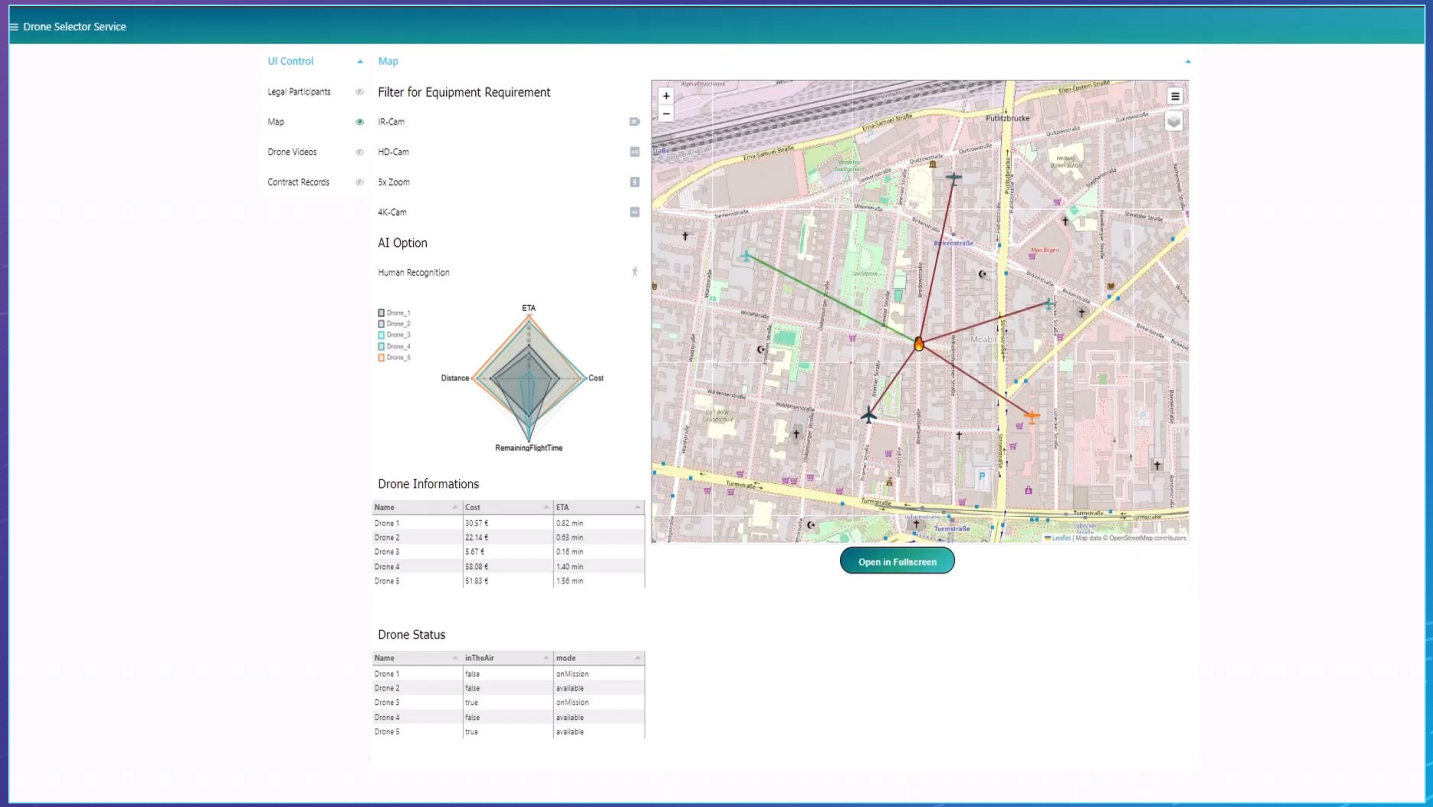
Drone Provider

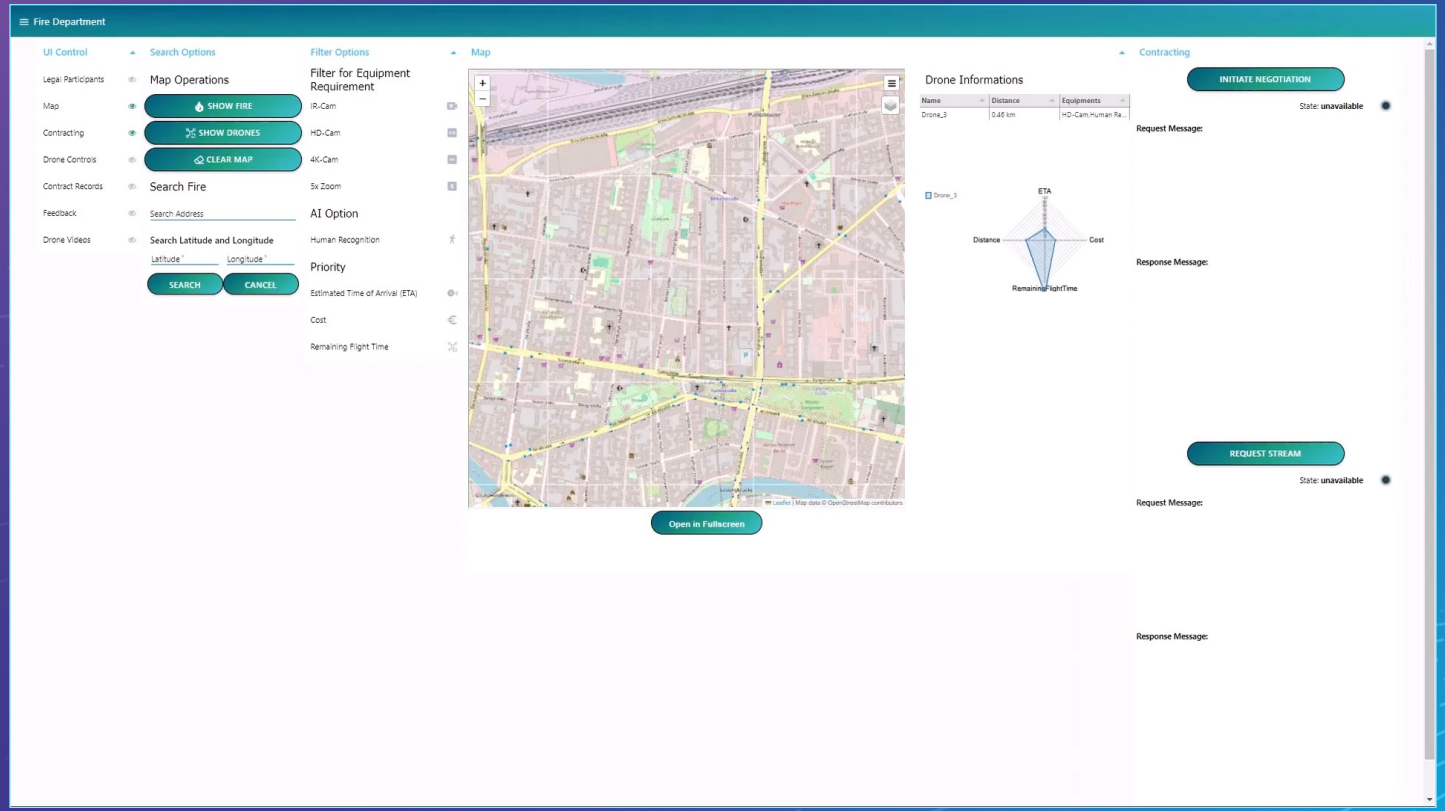
Drone


Catalog
Fire Department
Service Offering
Decentralized Identities
Catalog
Drone Provider
Drone


Contracting
Fire Department
Decentralized Identities
Catalog
Contracts
Drone Provider
Drone


Drone Usage Credential
Fire Department
Presentation of Credential
Decentralized Identities
Catalog
Contracts
Credentials
Drone Provider
Drone


Drone Selector Service
UI Control
Legal Participants
Map
Drone Videos
Contract Records
Map
Filter for Equipment Requirement
IR-Cam
HD-Cam
5x Zoom
4K-Cam
AI Option
Human Recognition
Drone_1
Drone_2
Drone_3
Drone_4
Drone_5
ETA
Distance
Cost
RemainingFlightTime
Drone Informations
Name | Cost | ETA
Drone 1 | 30.57 € | 0.82 min
Drone 2 | 22.14 € | 0.63 min
Drone 3 | 5.67 € | 0.16 min
Drone 4 | 58.08 € | 1.40 min
Drone 5 | 51.83 € | 1.56 min
Drone Status
Name | inTheAir | mode
Drone 1 | false | onMission
Drone 2 | false | available
Drone 3 | true | onMission
Drone 4 | false | available
Drone 5 | true | available
Putlitzbrücke
Open in Fullscreen


Fire Department
UI Control
Legal Participants
Map
Contracting
Drone Controls
Contract Records
Feedback
Drone Videos
Search Options
Map Operations
SHOW FIRE
SHOW DRONES
CLEAR MAP
Search Fire
Search Address
Search Latitude and Longitude
Latitude
Longitude
SEARCH
CANCEL
Filter Options
Filter for Equipment Requirement
IR-Cam
HD-Cam
4K-Cam
5x Zoom
AI Option
Human Recognition
Priority
Estimated Time of Arrival (ETA)
Cost
Remaining Flight Time
Map
Open in Fullscreen
Drone Informations
Name
Distance
Equipments
Drone_3
0.46 km
HD-Cam,Human Re...
Drone_3
ETA
Distance
Cost
RemainingFlightTime
Contracting
INITIATE NEGOTIATION
State: unavailable
Request Message:
Response Message:
REQUEST STREAM
State: unavailable
Request Message:
Response Message:

The main contribution of Gaia-X 4 AMS is to gain practical experience in the use of Gaia-X in mobility and to develop common rules and standards for both the use of the data space and the data description.

Onboarding Data Space

Service Offerings in Gaia-X Data Space

Integration and Connection of Data Sources

Recommendations for transfer to other cities and municipalities

Rules for Using the Data Space

Standards for Data Description

gaia-x AMS

Contact

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Project Lead
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Sten Ruppe

ODD Matching
Rico Auerswald

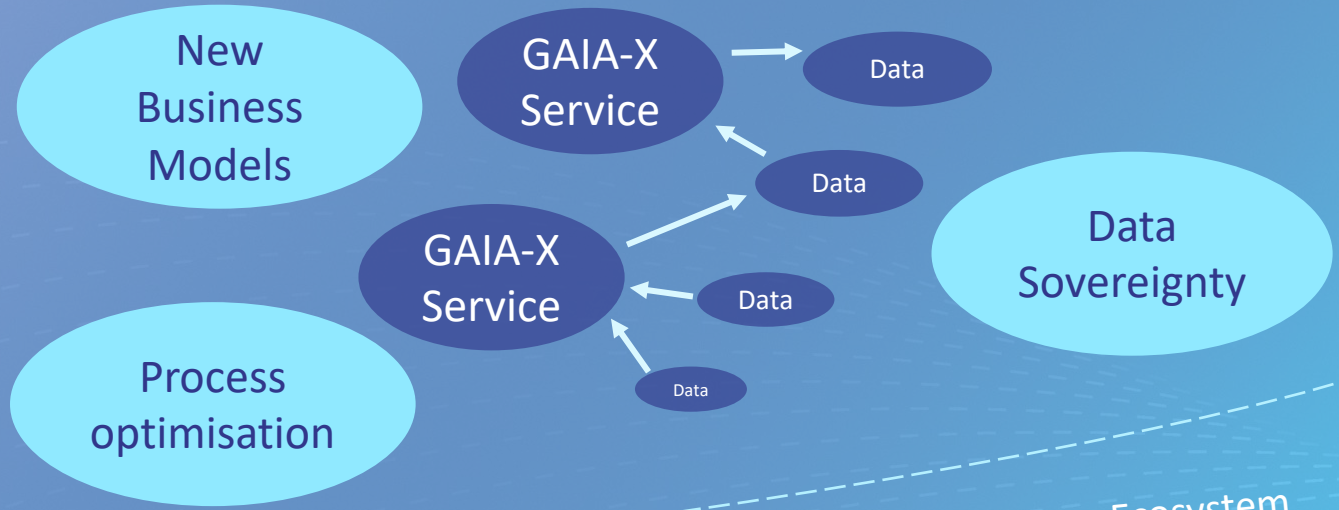
ODD Compliant Routing
Philip Meier

Drone Order & Flight
Marcus Olszok

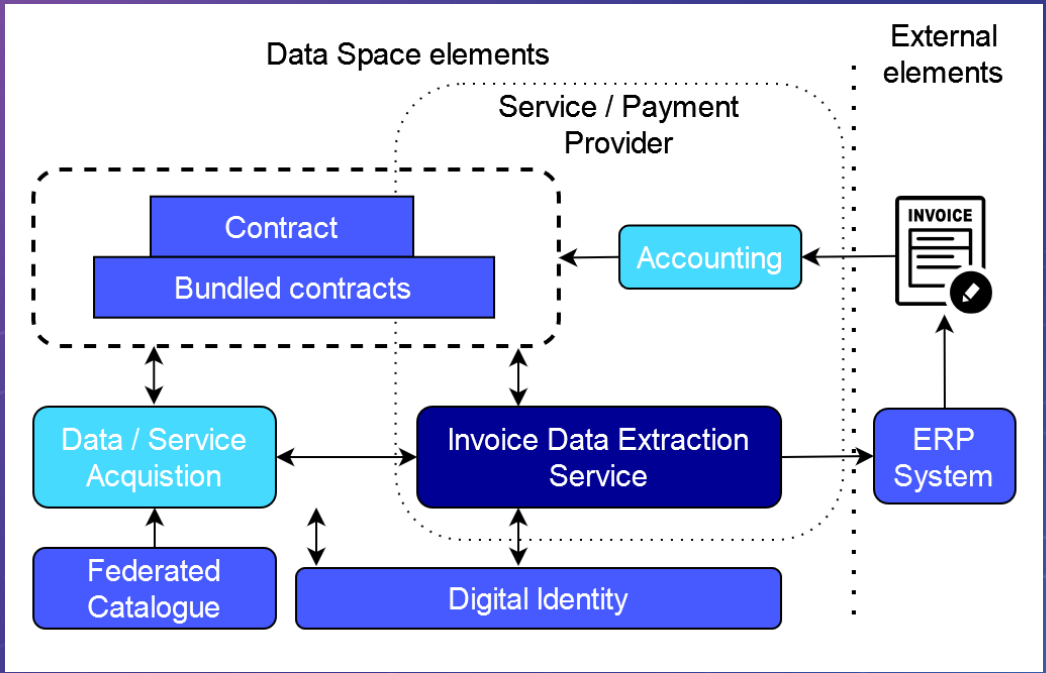
Drone Selection Service
Cansu Tanrikulu

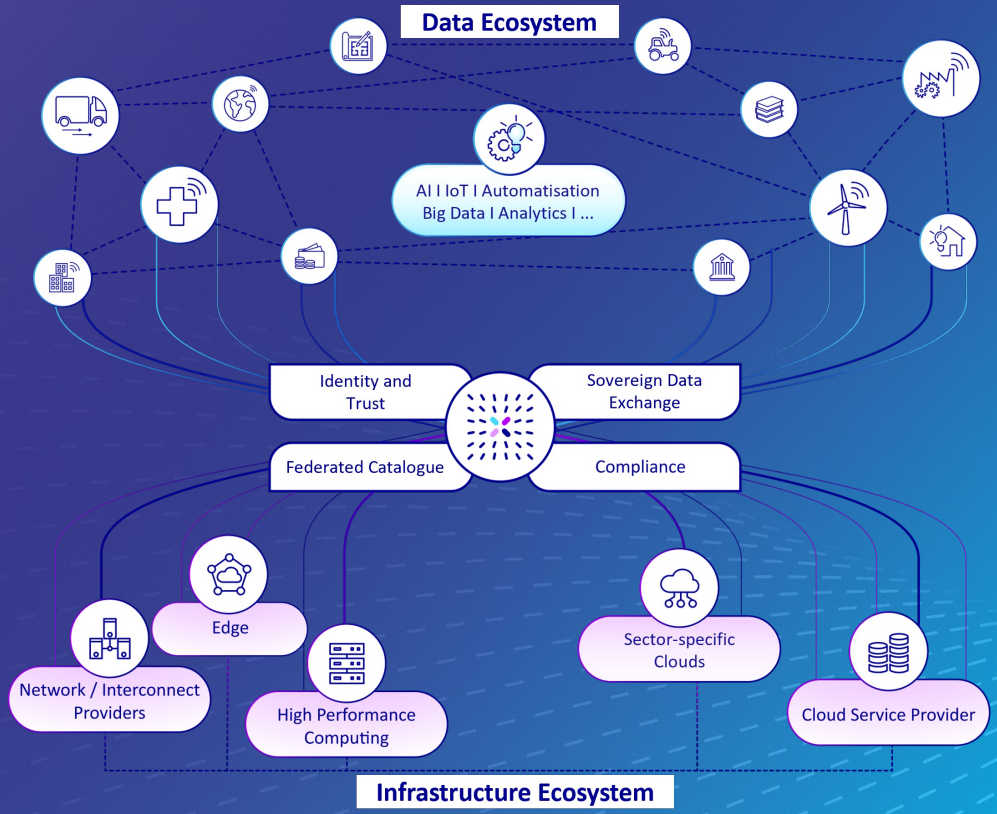
Governance
Jens Gessler

Benefits for the rescue mobility use case through GAIA-X



Payment in the AMS dataspace



- fully automated & integrated payment p rocesses (with smart contracts / payment provider)
- external modules like an ERP can be integrated
- no additional authentifications needed (a GaiaX identity is sufficient)

- A decentralized digital network based on European values
- Standardized, open, and safe digital environment
- Free and secure exchange of data and services