EU LDT TOOLBOX
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LDT-DS
Local Digital Twins & Data Spaces

Local Digital Twin

An LDT is a digital replica of the city that describes and represent the current state of the city.

To create a simulation of the LDT, cities need to **collect data** about their city, **use algorithms** (like mathematical instructions) to process this data, and **build models** (like representations of how things work) to understand the city's needs.

EU LDT Toolbox – Approach to every Urban Management Challenge

Mobility Planning
Low Emission Zone Use Case/Simulator
Urban Mobility model

Energy Optimization
Neighborhood energy demand forecasting model
Energy Efficiency model

Urban Health
Pollution Propagation model

Urban Planning
EU Building Database
Reconstruction model

Sustainability
Environmental footprint model for building

Implementing the EU LDT Toolbox for Urban Management

EU LDT Toolbox – Key Assets for Your City

DATABASE

DATABASE

European Building Database

Input

- GZF Potsdam
- Eubucco
- Global Human Settlement Layer
- EU Building Stock Observatory
- Instituto Valenciano de la Edificación

Output

The whole cities of Europe will be digitalized

- 3D City representation

MODEL

MODEL

Urban Mobility

Input

- Geospatial information,
- Number of cars entering the area

Output

- Links and intersections
- Topography
- Speed limits
- Rush hour data
- Traffic congestion zones

MODEL

Reconstruction

Input

- OpenStreetMap
- Satellite imagery
- Building archetype (Tabula)
- Expert knowledge

Output

- Reconstruction costs per building after a disaster

MODEL

Building environmental footprint

Input

- European Building Dataset
- Building Archetype (Tabula)
- Materials

Output

- CO_2-equivalent emissions

MODEL

Neighbourhood energy demand forecasting

Input

- European Building Dataset
- Building archetype (Tabula)
- Materials

Output

- Annual energy demand forecast at the neighbourhood level

MODEL

Pollution Propagation

Input

- Geospatial Information
- Meteorological Information

Output

- Large-scale polluntant concentration distribution

MODEL

Energy Efficiency

Input

- European Building Dataset
- Building archetype (Tabula)
- Materials

Output

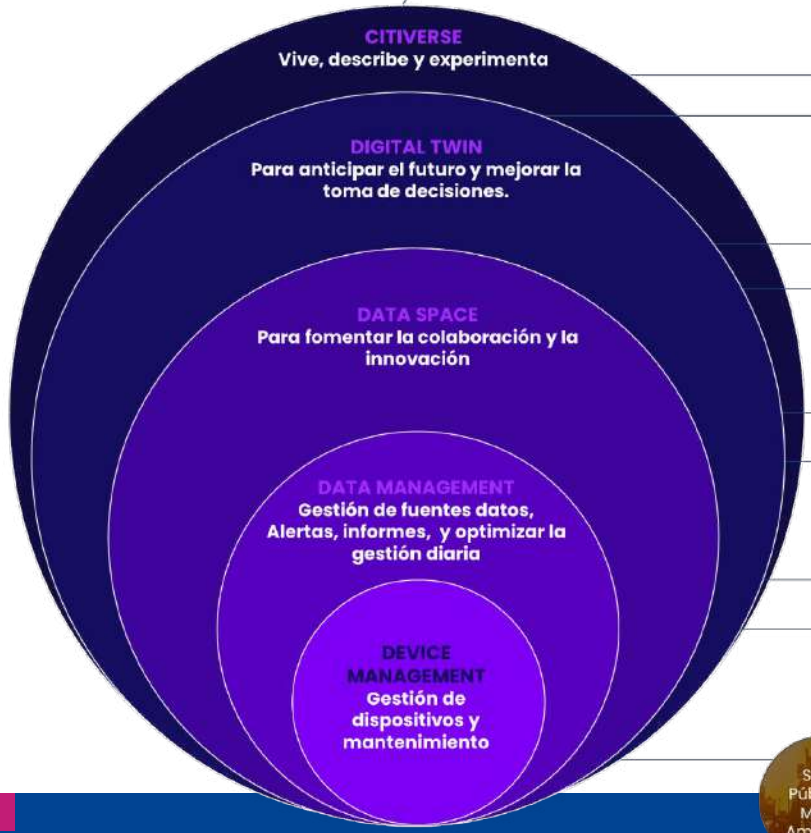
- Building energy efficiency ratings

EU LDT TOOLBOX

LDT - DS

GOBIERNO DE ESPAÑA
VICEPRESIDENCIA PRIMERA DEL GOBIERNO
MINISTERIO DE ASUNTOS ECONÓMICOS Y TRANSFORMACIÓN DIGITAL
SECRETARÍA DE ESTADO DE DIGITALIZACIÓN E INTELIGENCIA ARTIFICIAL

LDT – DS: Local Digital twin and Data Spaces



BUSCO

Acceso y visualización 3D para ofrecer experiencias inmersivas, facilitar comunicación y efecto WoW

iris360

Visualización en 3D, AR/VR y sobre los GIS más populares (ESRI, Bentley-CESIUM, etc.)

BUSCO

Crear réplicas virtuales de infraestructuras físicas para simular escenarios, predecir resultados y optimizar operaciones

iris360

Proporciona una herramienta avanzada para la toma de decisiones proactivas y la simulación de estrategias antes de implementarlas en el mundo real.

BUSCO

Compartir y comercializar datos de forma segura y controlada entre organizaciones, garantizando la soberanía y privacidad.

iris360

Incorpora conectores avanzados, herramientas de gobernanza, y soporte para estándares europeos como GAIA-X, IDSA, y FIWARE.

BUSCO

Dashboards personalizados, alertas en tiempo real y herramientas de análisis que facilitan la toma de decisiones informadas.

iris360

Facilita la comprensión de datos complejos a través de visualizaciones intuitivas, optimizando operaciones y recursos.

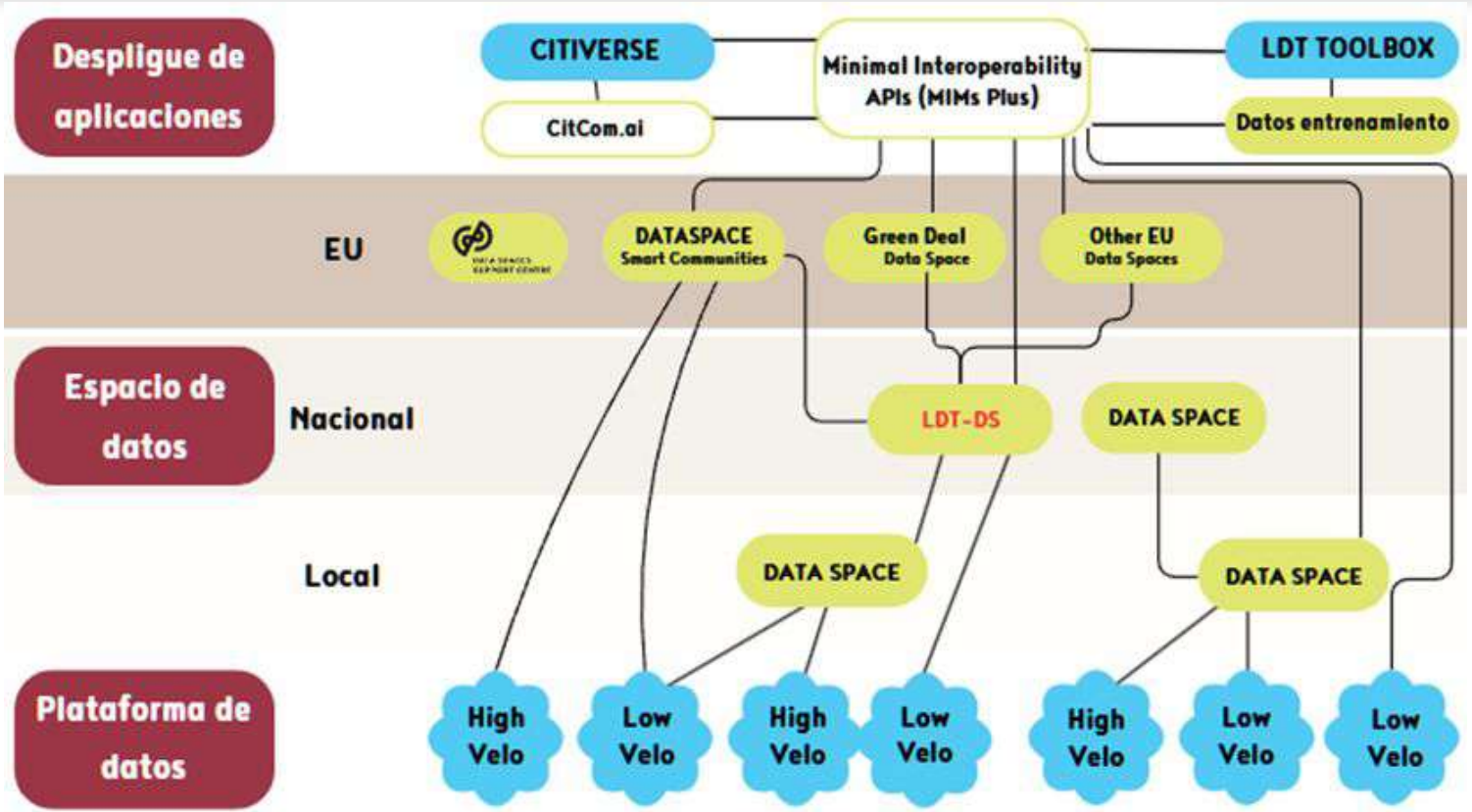
BUSCO

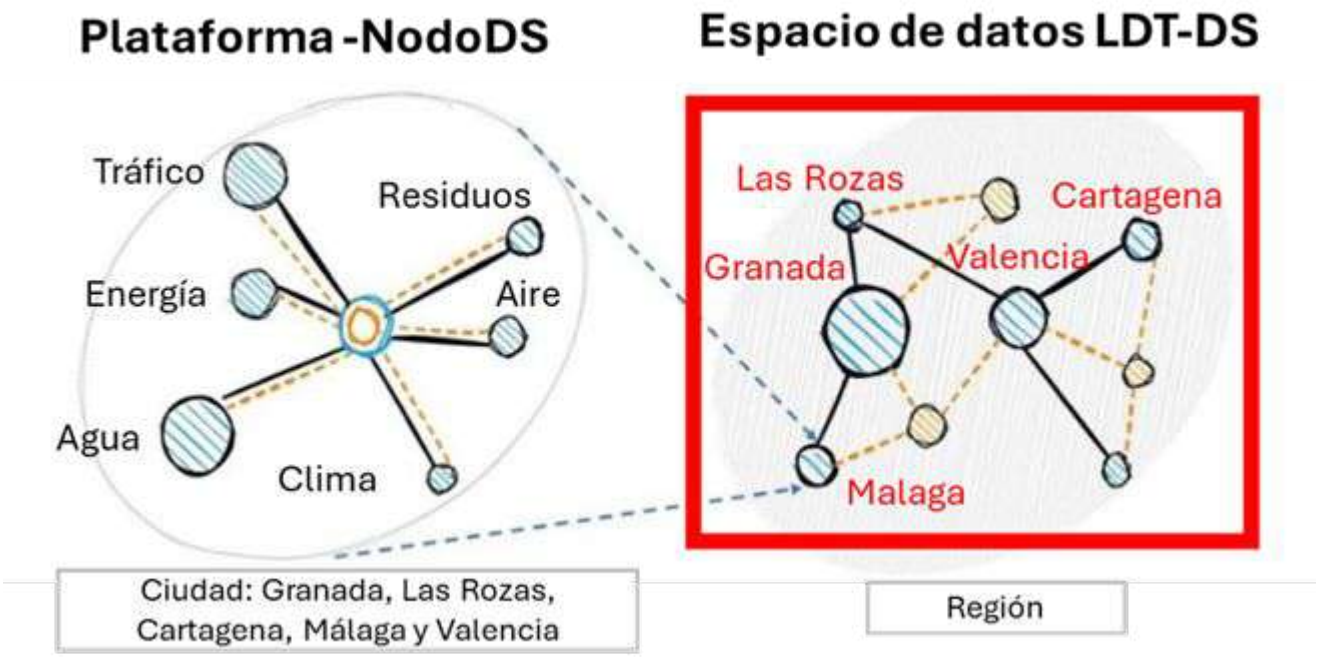
Gestión eficiente de dispositivos conectados, asegurando su configuración, monitoreo y mantenimiento en tiempo real

iris360

Garantizamos una infraestructura sólida y funcional sobre la que se construirán servicios de mayor valor

LDT – DS role


Despligue de aplicaciones
CITIVERSE
CitCom.ai
Minimal Interoperability APIs (MIMs Plus)
LDT TOOLBOX
Datos entrenamiento
EU
DATASPACE Smart Communities
Green Deal Data Space
Other EU Data Spaces
Espacio de datos
Nacional
LDT-DS
DATA SPACE
Local
DATA SPACE
DATA SPACE
Plataforma de datos
High Velo
Low Velo
High Velo
Low Velo
High Velo
Low Velo
Low Velo


Plataforma -NodoDS
Tráfico
Residuos
Energía
Aire
Agua
Clima
Ciudad: Granada, Las Rozas, Cartagena, Málaga y Valencia
Espacio de datos LDT-DS
Las Rozas
Cartagena
Granada
Valencia
Malaga
Región

EU LDT TOOLBOX

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An example of the LDT:
Implementing a Low Emission Zone

Funded by
the European Union

Urban management challenges

Mobility Planning

Ene

Urb

Urb

Sus

Example

Better quality of urban life through Low Emission Zones (LEZs)

The Challenge:

Reduce vehicle emissions in cities.

The desired solution:

A cleaner, healthier and more sustainable urban environment.

How would an LDT help?

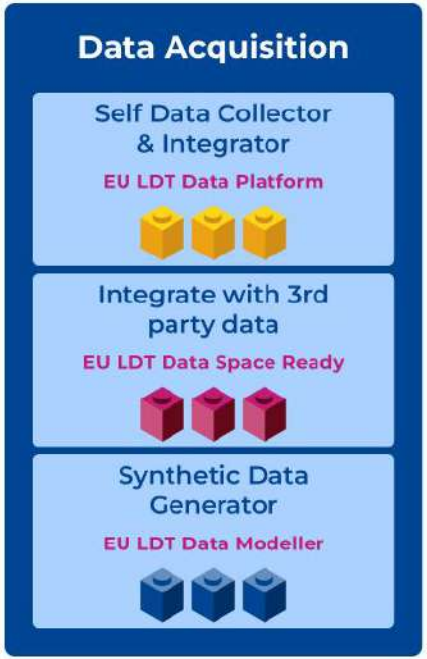
- **Solution Design**: by simulating and testing the LEZ's emission reduction effect
- **Feasibility Analysis**: by comparing different LEZ solutions based on their simulation outcomes and supporting informed decision-making.
- **Continuous Monitoring**: by tracking real-time pollution data for continuous LEZ improvement
- **Documentation and reporting** : by documenting the LEZ design and implementation process, also for regulatory compliance and planning updates

Implementing Low Emission Zones with LDT Toolbox

The Toolbox – Tool by Tool

Gather your Data

The **data of your city** is collected from sensors, data spaces, and more.
This data can be integrated with **synthetic data** if the existing data is insufficient and complemented with **third-party data** to address specific needs.



From Data to Knowledge

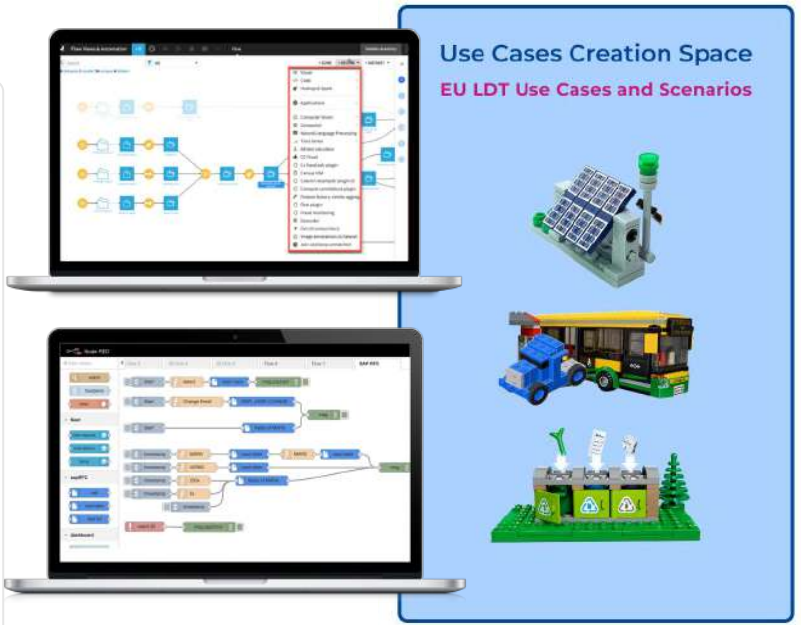
Users can create, edit, and train algorithms in three ways:

1. Train **your own private data**.
2. Use a **default repository** offering algorithms (e.g., pollution, traffic, weather).
3. Import solutions **from the Marketplace**.

The LDT also provides **Federated Learning** for training and scaling models securely with third parties without compromising private data.

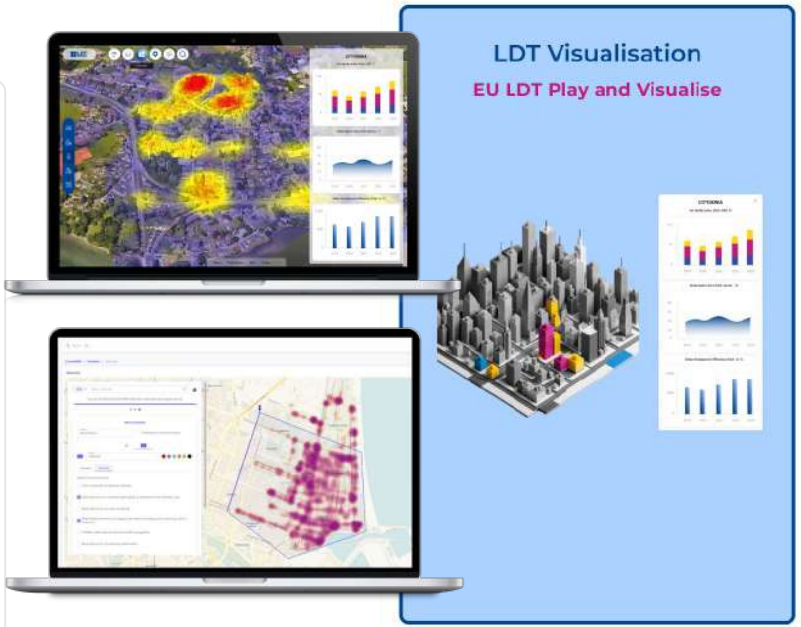
Simulate What if scenarios

Use Case and Scenarios functions as a space for creating and simulating urban scenarios to evaluate strategies before implementation.

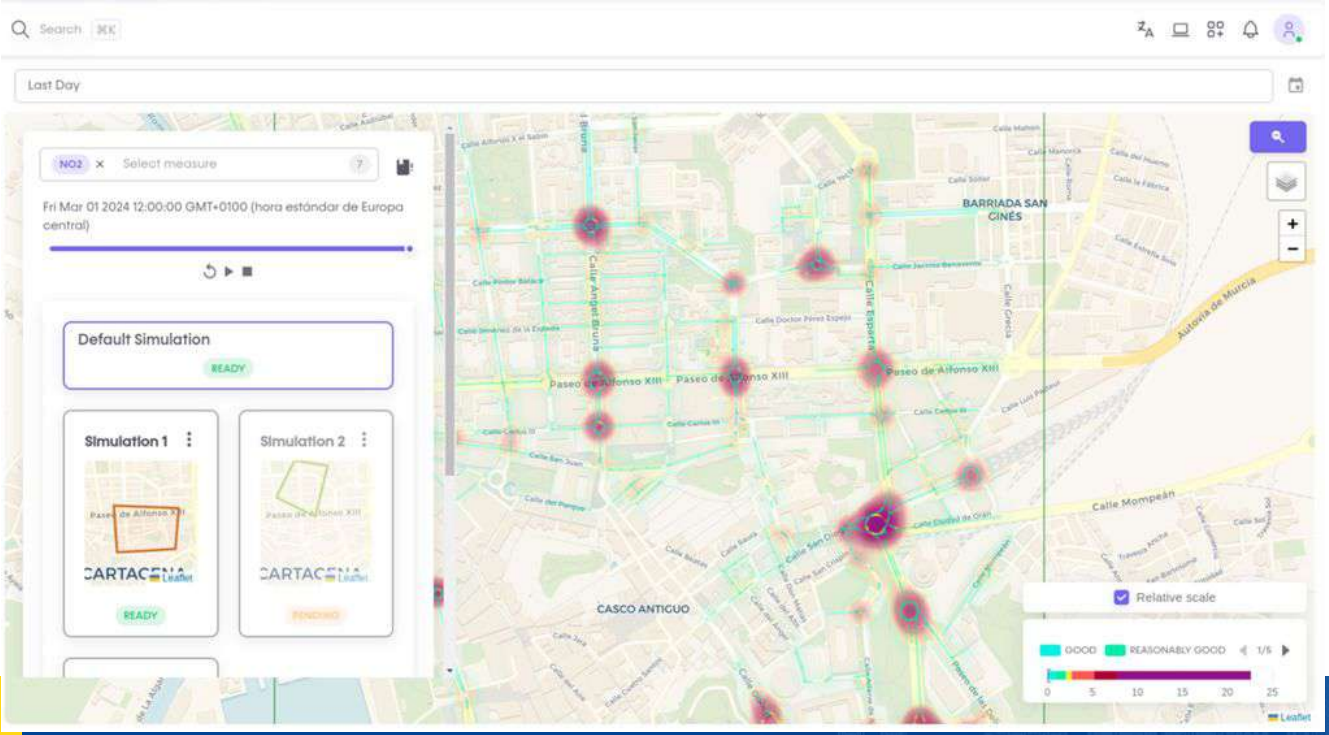


Visualize the impact

It helps you visualize the results through **extended reality**, **geospatial visualisations** and **advanced analytics**.
Make faster and more informed decision-making by providing insights that are easy to interpret and share with stakeholders.



Visualize the impact



Ask your citizens, make informed decisions and measure

Simplify community engagement by allowing you to easily gather and integrate citizen feedback.

The **City Innovation Planner** helps monitor city evolution by setting KPIs based on the simulation of key verticals.

Service Applications

Citizen Engagement
EU LDT Participate

City Digital Transformation Road map Manager
EU LDT City Innovation Planner

EU LDT TOOLBOX

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Follow Us

and be part of the revolution

@ldttoolbox

EU LDT Toolbox

Funded by the European Union

EU LDT TOOLBOX

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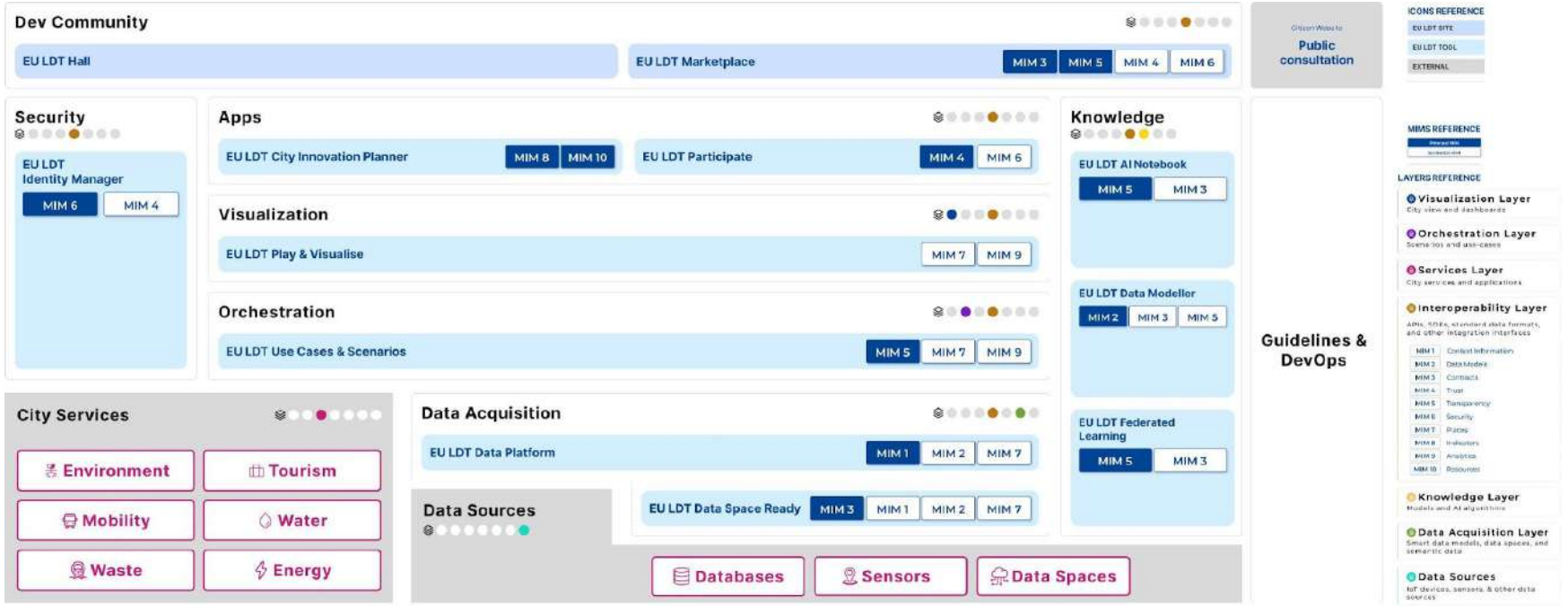
Reference Architecture

Funded by
the European Union


Dev Community
EU LDT Hall
EU LDT Marketplace
MIM 3
MIM 5
MIM 4
MIM 6
Citizen Voice to
Public consultation
ICONS REFERENCE
EU LDT SITE
EU LDT TOOL
EXTERNAL
Security
EU LDT Identity Manager
MIM 6
MIM 4
Apps
EU LDT City Innovation Planner
MIM 8
MIM 10
EU LDT Participate
MIM 4
MIM 6
Visualization
EU LDT Play & Visualise
MIM 7
MIM 9
Orchestration
EU LDT Use Cases & Scenarios
MIM 5
MIM 7
MIM 9
Knowledge
EU LDT AI Notebook
MIM 5
MIM 3
EU LDT Data Modeller
MIM 2
MIM 3
MIM 5
EU LDT Federated Learning
MIM 5
MIM 3
Guidelines & DevOps
MIMS REFERENCE
LAYERS REFERENCE
Visualization Layer
City view and dashboards
Orchestration Layer
Scenarios and use-cases
Services Layer
City services and applications
Interoperability Layer
APIs, SDKs, standard data formats, and other integration interfaces
MIM 1 Context Information
MIM 2 Data Models
MIM 3 Contracts
MIM 4 Trust
MIM 5 Transparency
MIM 6 Security
MIM 7 Places
MIM 8 Indicators
MIM 9 Analytics
MIM 10 Resources
Knowledge Layer
Models and AI algorithms
Data Acquisition Layer
Smart data models, data spaces, and semantic data
Data Sources
IoT devices, sensors, & other data sources
City Services
Environment
Tourism
Mobility
Water
Waste
Energy
Data Acquisition
EU LDT Data Platform
MIM 1
MIM 2
MIM 7
Data Sources
EU LDT Data Space Ready
MIM 3
MIM 1
MIM 2
MIM 7
Databases
Sensors
Data Spaces

EU LDT TOOLBOX
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Extra details:

Use Case
Low Emission Zones

Funded by
the European Union

Use Case – Low Emission Zone

Use case for Low Emission Zone – Low emission Regulations

Monitor the compliance with local, regional, and national low emission regulations.

A. **Prerequisites**:
   a. Pollution models
   b. Traffic models

B. **Tools**:
   a. EU LDT Use Cases & Scenarios
   b. EU LDT Data Platform
   c. EU LDT AI Notebook
   d. EU LDT Play & Visualise

C. **Assets**:
   a. City Traffic Dataset
   b. Sentinel satellite Dataset
   c. IoT sensors Dataset
   d. LEZ models collection

Use Case: Low Emission Zone (LEZ)

The city wants to implement a **Low Emission Zone (LEZ) pilot**, integrating comprehensive environmental and socio-demographic analyses.

The *EU LDT Toolbox* helps to:

- **Simulate** the impact of various LEZ strategies, examining potential outcomes and optimizations.
- **Visualize** the potential for enhanced social cohesion and support for the city's transition to sustainable practices.

Use Case: LEZ - Benefits

Optimal Implementation and Design

Tests various urban development scenarios to enhance green zones and reduce emissions, ensuring environmentally and socially beneficial strategies are applied.

Feasibility Analysis

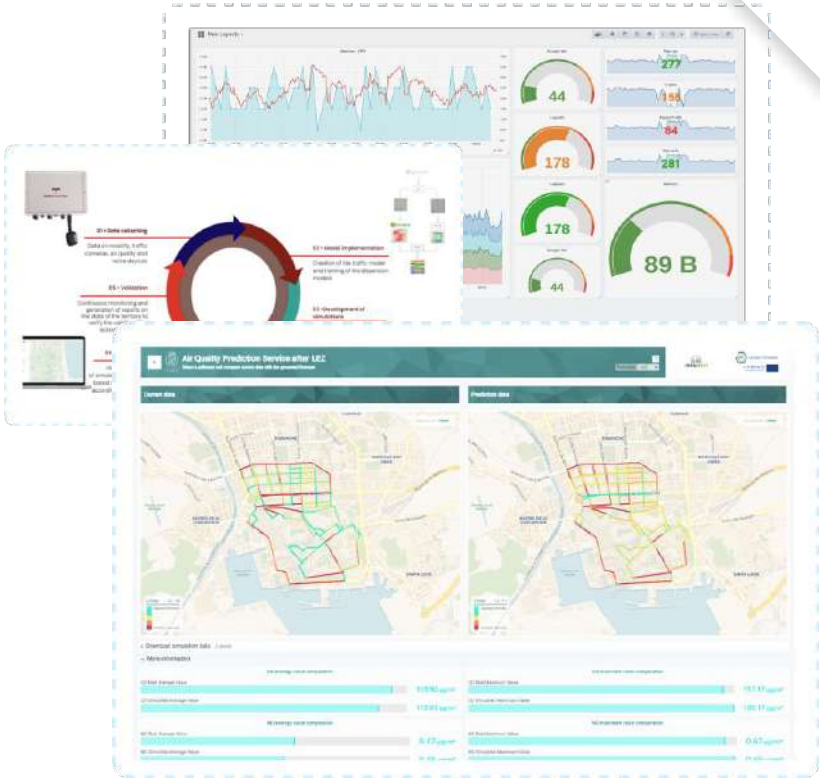
Facilitates pre-implementation analysis, allowing stakeholders to visualize potential outcomes and make informed decisions.

Continuous Monitoring

Monitor ongoing projects, compare real conditions to initial simulations, and provide continuous feedback for adaptive management.

Documentation and Reporting

Maintains detailed records of planning and implementation processes within the EU LDT Toolbox, ensuring compliance, future planning accuracy, and public transparency.



Use Case: LEZ - Actions

With the insights gained from his simulations, formulate a comprehensive plan for the city, introducing innovative projects:

❑ Green Zone Expansion

Expand green spaces with air-purifying plants and sensor-based air quality monitors.

❑ Smart Access Management

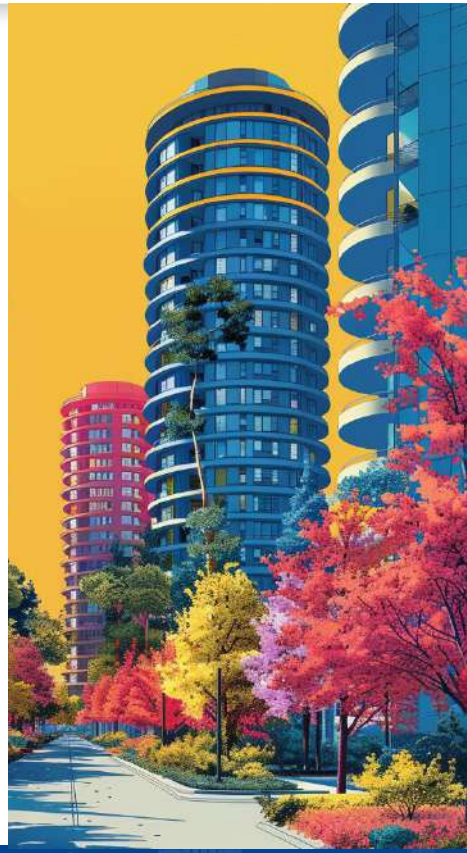
Deploy smart cameras and AI to control vehicle access and optimize traffic in the LEZ.

❑ Sustainable Mobility Solutions

Enhance public transport and non-motorized travel options to reduce reliance on private vehicles.

❑ Community Integration Programs

Host bi-monthly workshops to align LEZ projects with community needs and feedback.



Use Case: LEZ - Evaluation of Results

Initial Results:
Significant gains in environmental sustainability and community cohesion have been achieved, enhancing safe and inclusive urban spaces.

Pilot Success:
Motivated by the pilot's achievements, continuously refine the city urban strategies using the EU LDT Toolbox, promoting an active sustainability agenda.

Broader Applications:
The positive outcomes inspire to explore the EU LDT Toolbox for wider use in urban development projects.