

Making AI Work Across Cities

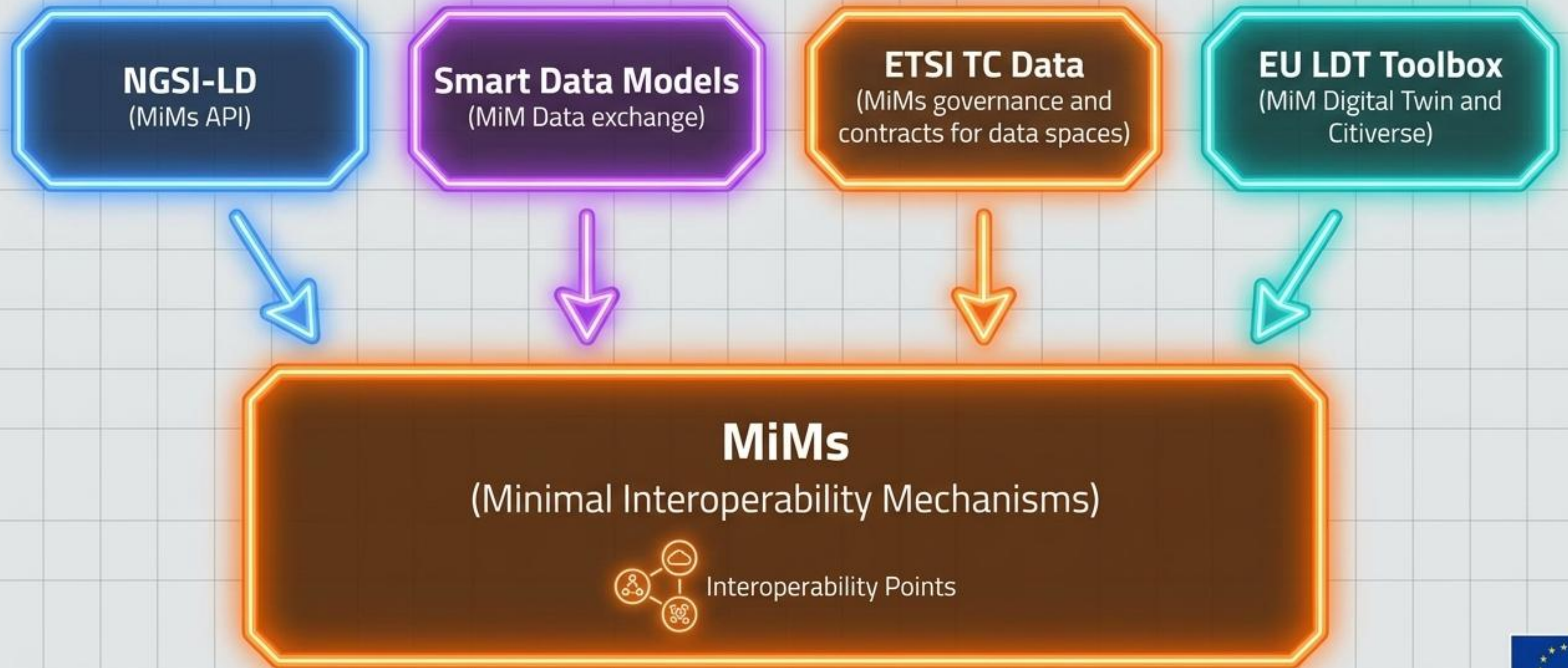
Interoperability, Standards, and Trust



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Forum on "AI and Citiverse: Building the Foundations
for Interoperable and Scalable Urban Innovation"
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The Interoperability Framework: NGSI-LD, Smart Data Models, ETSI TC Data, and EU LDT Toolbox





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The Inclusion Imperative

If the digital environments we build cannot be accessed and used by everyone—including persons with disabilities—they cannot truly be considered smart or people-centered.

Interoperability, underpinned by Minimal Interoperability Mechanisms (MiMs), is the driver of inclusion. By linking disparate data streams (FIWARE context brokers, air quality, mobility) into the SENSE Citiverse, cities like Cartagena translate raw data into actionable, accessible human experiences.





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Discovering the Citiverse

The Global Initiative on AI, Digital Twins and Virtual Worlds
reinforces a unified vision for our urban future.

Inclusive



Designed for all citizens,
removing digital barriers.

Trusted



Built on secure, sovereign
data governance.

Scalable

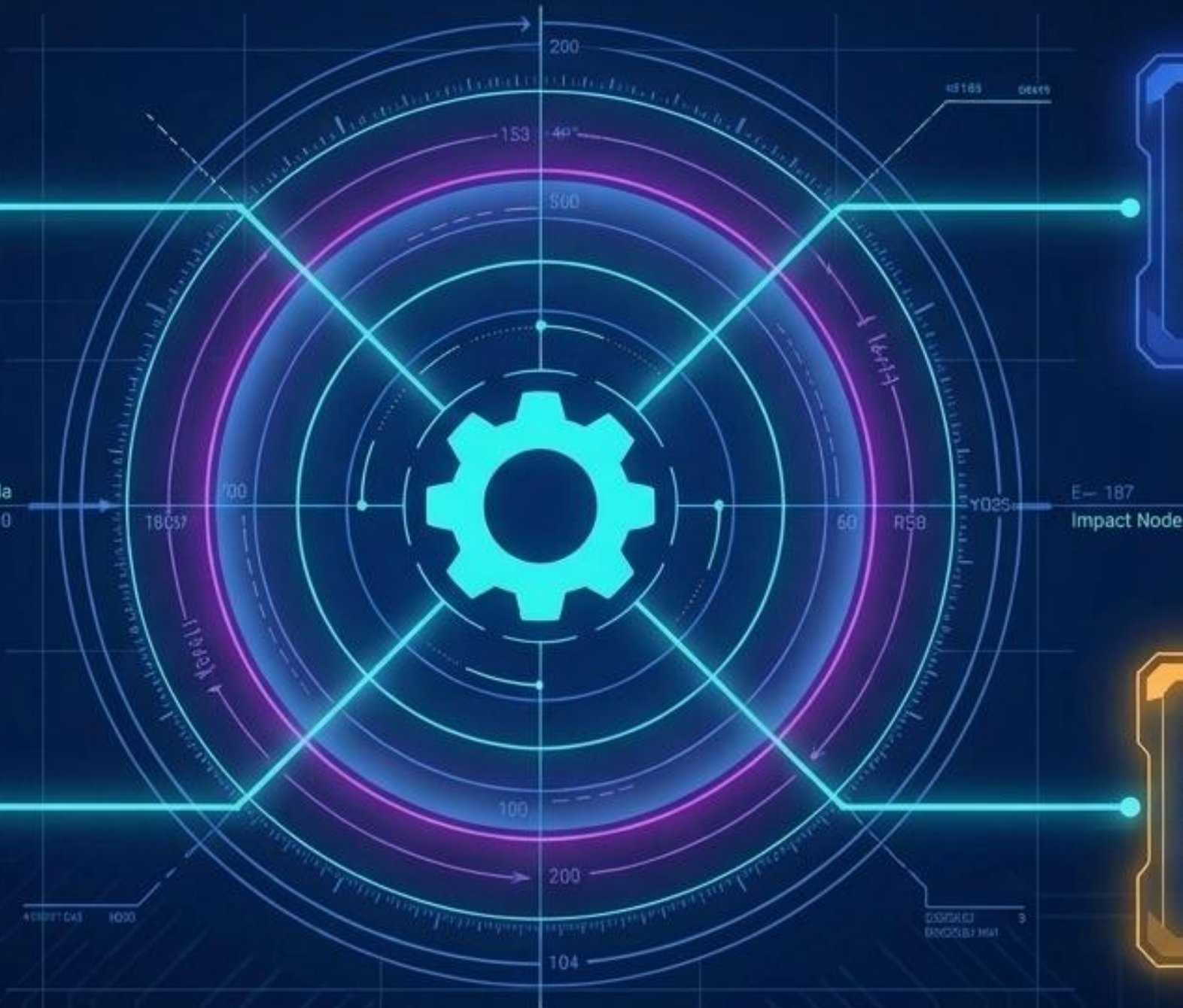


Moving seamlessly from
local pilots to cross-
border federations.

Interoperable



Supported by rigorous
international standards.





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The System-of-Systems Challenge

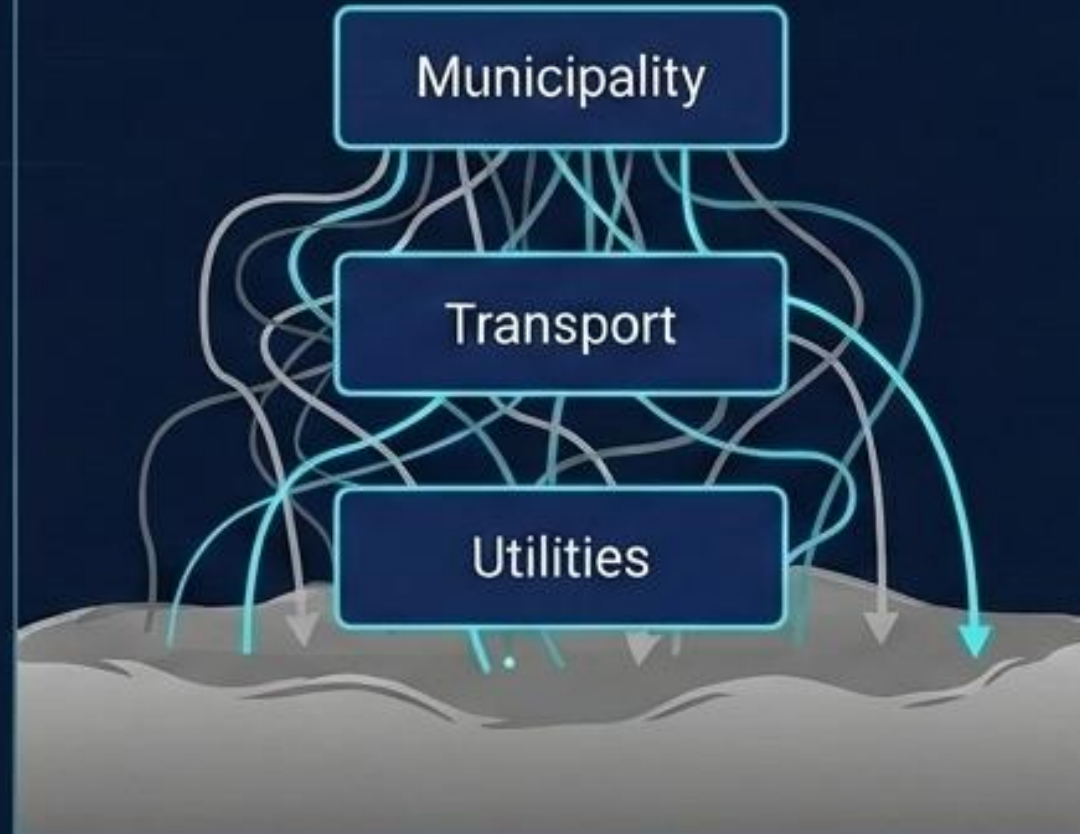
Urban data products rarely reside in a single administrative silo. Heat-risk assessment requires local temperature, satellite imagery, demographic vulnerability, and emergency capacity.

Isolated Silos



Fragmented domains with
walled-off databases.

Centralized Lakes



Unstructured pooling forces
loss of data sovereignty.

Federated Data Spaces



Autonomous systems linked by SIMPL
and Eclipse EDC, preserving participant
sovereignty while enforcing
interoperability under explicit rules.



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The Connected Urban Ecosystem

Moving from individual AI solutions towards a coherent, trusted urban AI ecosystem requires interlocking mechanics.

**SIMPL and
Data Spaces**
Trust & Exchange



EU LDT Toolbox
Intelligence & Orchestration

SENSE Citiverse
Experience & Inclusion

Governed by EDIC BUILD and OASC MIMs



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EU LDT Toolbox Data Space Ready

Enabling seamless integration and participation in federated urban data ecosystems through standardized interoperability.





The Anatomy of Federation

Successful federation extends far beyond protocol exchanges. A protocol is only successful if governance, meaning, and enforcement remain coherent across all 10 layers.

Governance Plane

Governance & Participation,
Identity & Trust,
Security & Assurance

Control Plane

Resource Description,
Semantic Interoperability,
Policy & Contract,
Federation & Mediation

Data Plane

Protocol & Exchange,
Lifecycle & Operations,
Smart City/LDT Context



Friction Point: Semantic Interoperability

JSON-LD contexts prevent
flattening of identifiers and loss
of spatial/temporal meaning.

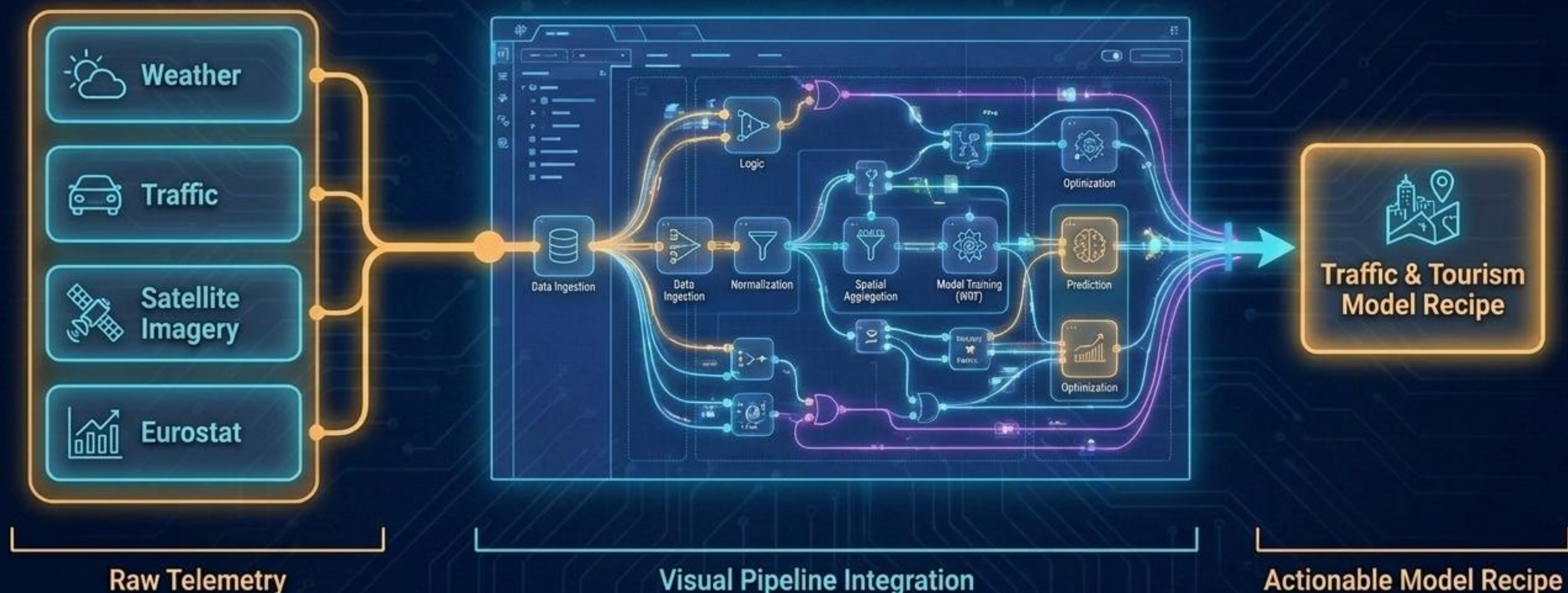
Friction Point: Semantic Interoperability

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Orchestrating Urban AI

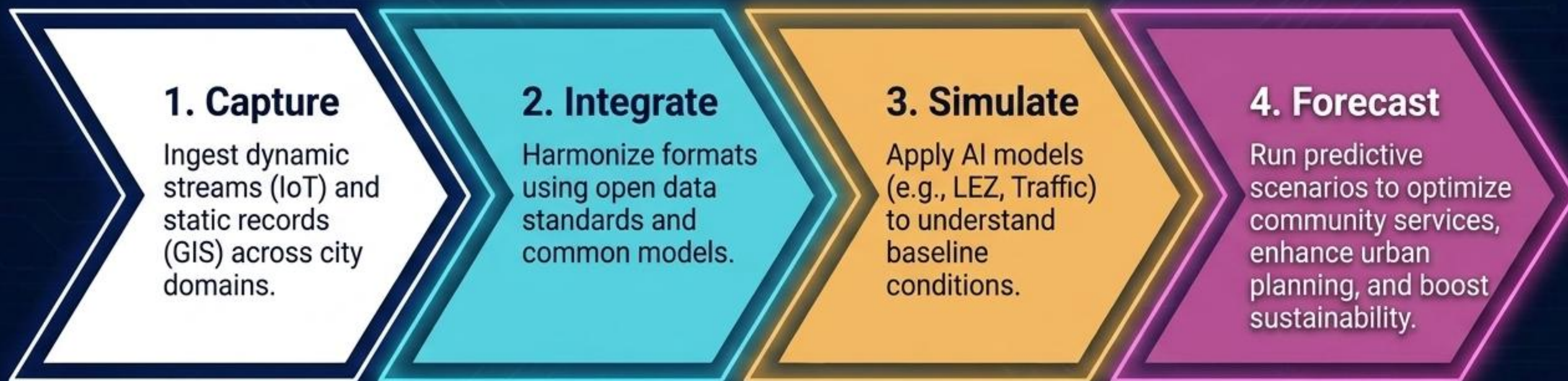
The EU LDT Toolbox empowers cities to master AI orchestration using node-based pipelines. By integrating raw data through a visual, automated pipeline, cities can develop complex algorithms—such as the Weather Research & Forecasting (WRF) model—without writing manual integration code from scratch.





The LDT Data-to-Decision Pipeline

From raw telemetry to urban intervention.

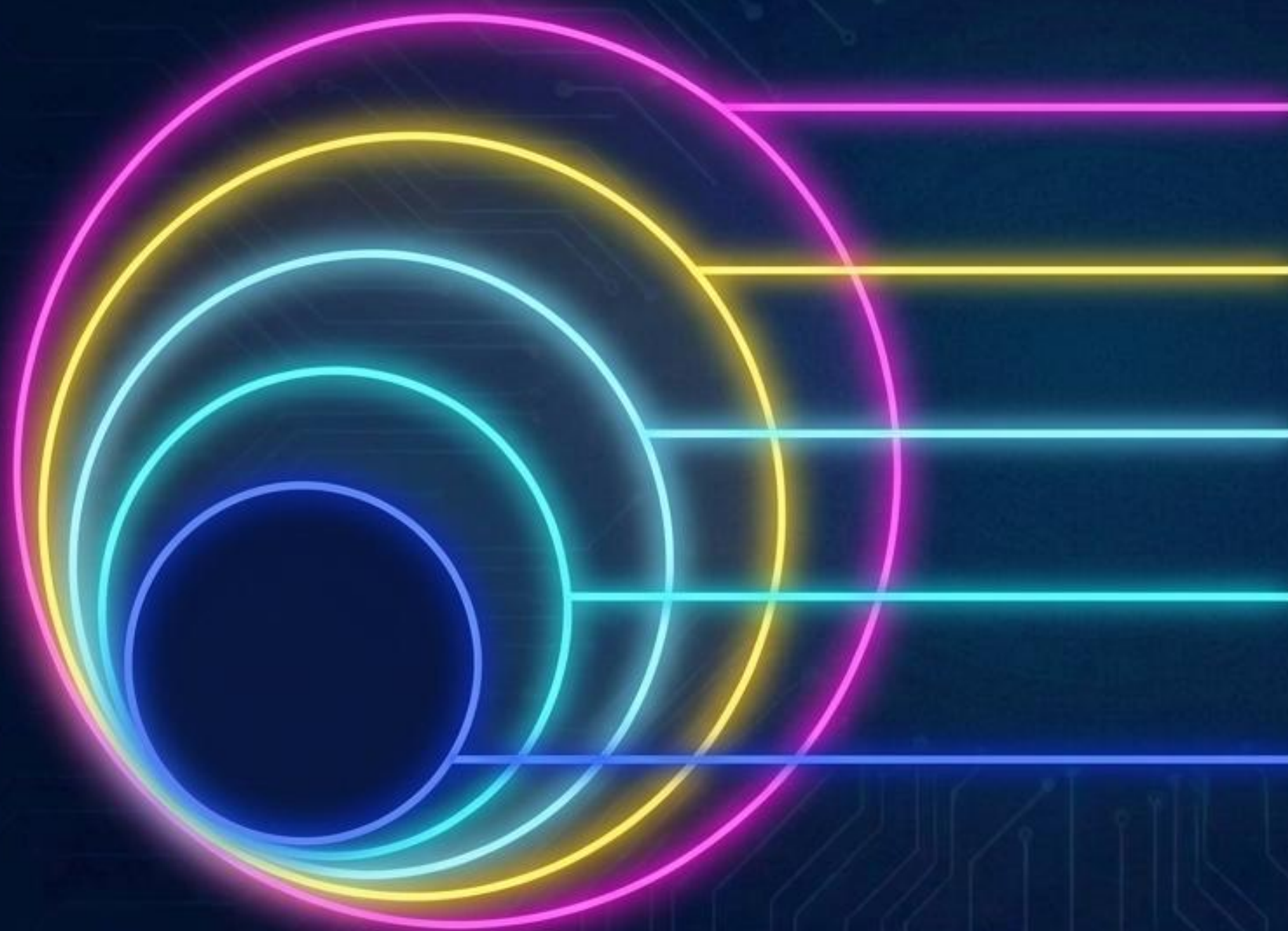




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The Evolution to the Citiverse

The progression of urban intelligence builds outward, culminating in immersive 3D environments.



CITIVERSE

Live, understand, and experience the city.

Digital Twin

Simulate, collaborate, and apply AI.

Data Space

Exchange data with sovereignty and trust.

Data Platform

Integration and sources.

Device Management

IoT and edge computing.



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The SENSE Project Framework

Strengthening Cities and Enhancing Neighbourhood Sense of Belonging.

SENSE develops an open, interoperable Citiverse framework based on Gaia-X. By launching in two frontrunner cities and replicating across four follower cities, SENSE creates a scalable, pre-standardized model for implementing immersive virtual worlds across the EU.

Budget

€7.72M (€3.86M
EU Contribution)

Timeline

Dec 2024 – May 2027

Frontrunners

Cartagena (ES),
Kiel (DE)

Followers

Arezzo (IT), Valongo (PT),
Murcia (ES), Ulm (DE)

The diagram features a central 'SENSE Hub' logo, which is a blue square with a stylized 'S' and 'H' icon. Below the logo, the text 'SENSE Hub' is written in white. The hub is connected to four colored lines (blue, yellow, pink, and cyan) that extend upwards to four corresponding colored boxes. These boxes are arranged horizontally and contain information about the project's budget, timeline, frontrunners, and followers. The background is dark blue with a subtle circuit pattern.

SENSE Hub



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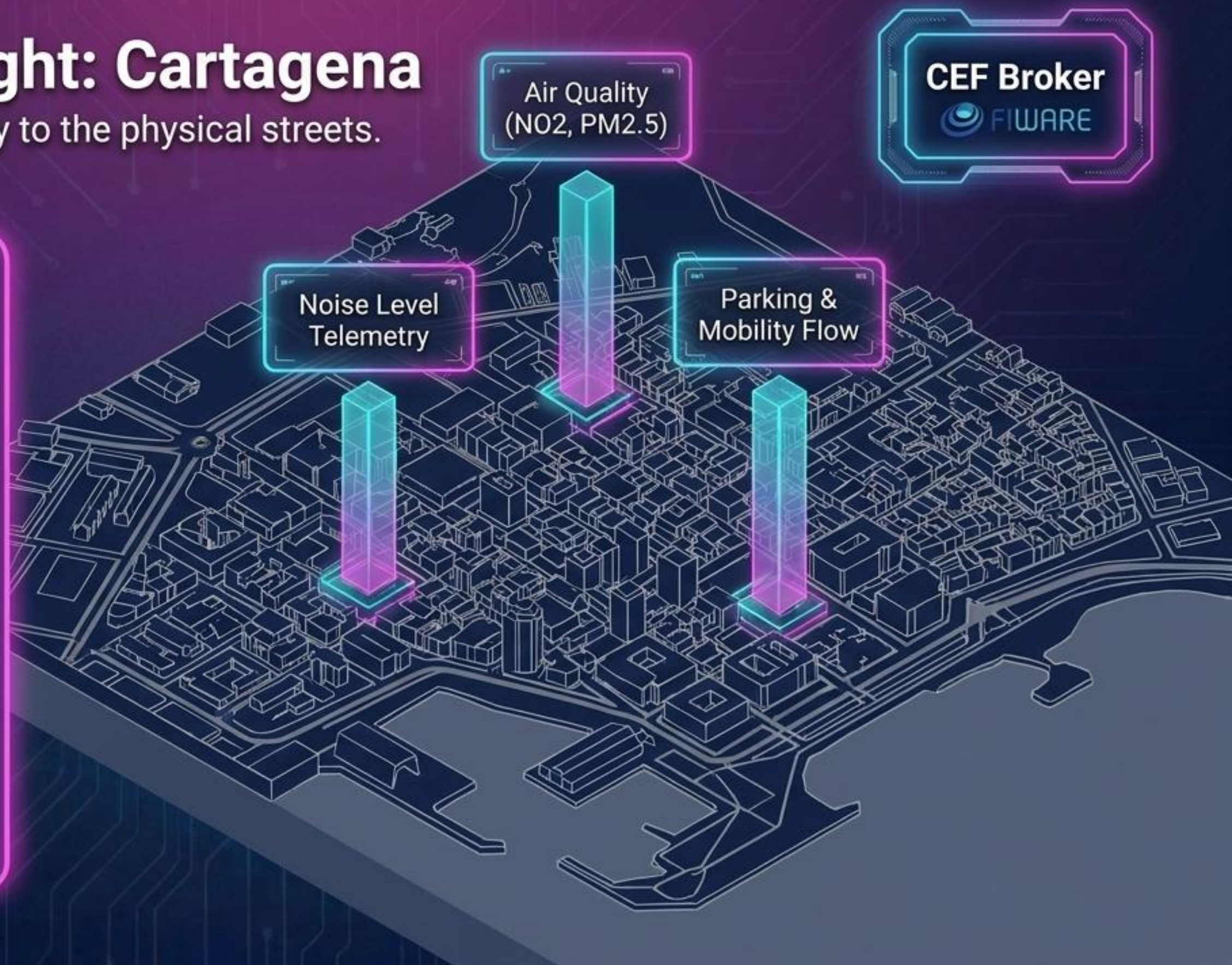
Frontrunner Spotlight: Cartagena

Applying theoretical interoperability to the physical streets.

Frontrunner Spotlight: Cartagena

Applying theoretical interoperability
to the physical streets.

Cartagena is utilizing the SENSE framework to integrate disparate environmental and mobility data into a cohesive FIWARE Context Broker. By monitoring air quality, noise, and people flow in real-time, the city digitalizes decision-making—transforming reliable KPIs into actionable, inclusive urban policies.



SENSE Platform - Cartagena

SENSE Platform - Cartagena Deployment is a real at the implerter instance in Iris360.

The Iris360-a new sensor ardoip:ate a orabit of data implementation sur SENSE project.

SENSE Platform - Cartagena Deployment





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Synthesizing the Blueprint

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The true value of a Smart City is not found in isolated capabilities, but in deliberate orchestration.

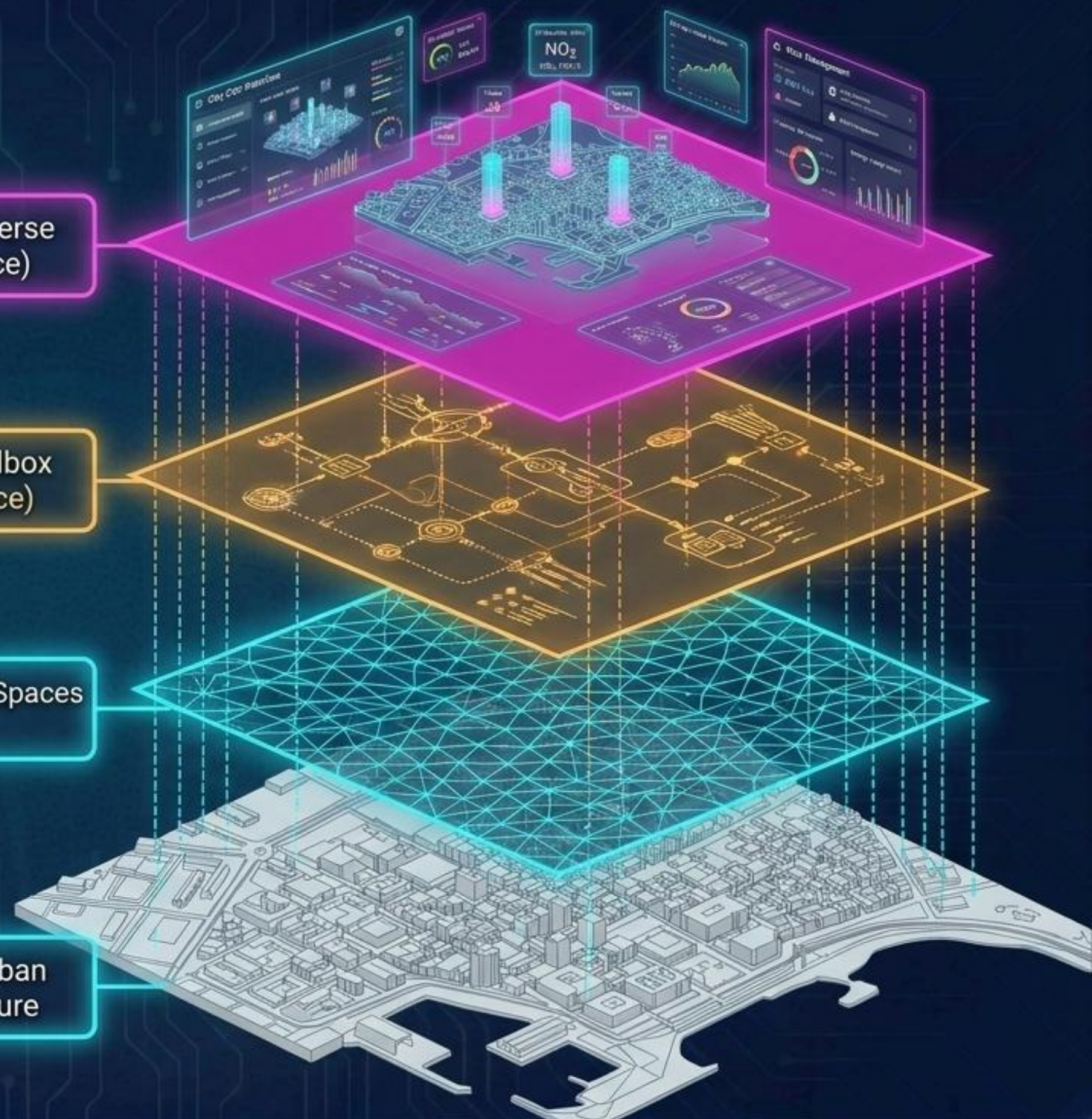
When international standards govern trust (SIMPL), automated pipelines derive intelligence (LDT Toolbox), and immersive interfaces democratize access (SENSE), we move beyond mere technology. We build an interconnected, inclusive Citiverse that works for everyone.

SENSE Citiverse
(Experience)

EU LDT Toolbox
(Intelligence)

SIMPL & Data Spaces
(Trust)

Physical Urban
Infrastructure





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Thank You

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