City procurement and Urban Digital Twins

Working with UDT providers. A comprehensive overview

Marc Pérez-Batlle

About me

- Telecommunications and Aeronautics research background
- 7 years IT Innovation at the Municipality of Barcelona
- Currently, Algorithmic Supervision at the Joint Research Centre, European Commission

About me

Objective

- How to buy a set of software and hardware building blocks that will be part of the UDT implementation taking into account:
  - The technological stack involved in UDT.
  - City governance and internal organization.
  - Public procurement particularities specially when they come to IT-related purchases.

Outline

- Objective
- Setting the scene:
  - **What is needed to buy?** The technological stack involved in an UDT.
  - **Who needs to buy?** The impact of the municipality organitzation.
  - **How should it be bought?** The public procurement framework
- How to procure digital twins?
- Examples of architectures and use cases

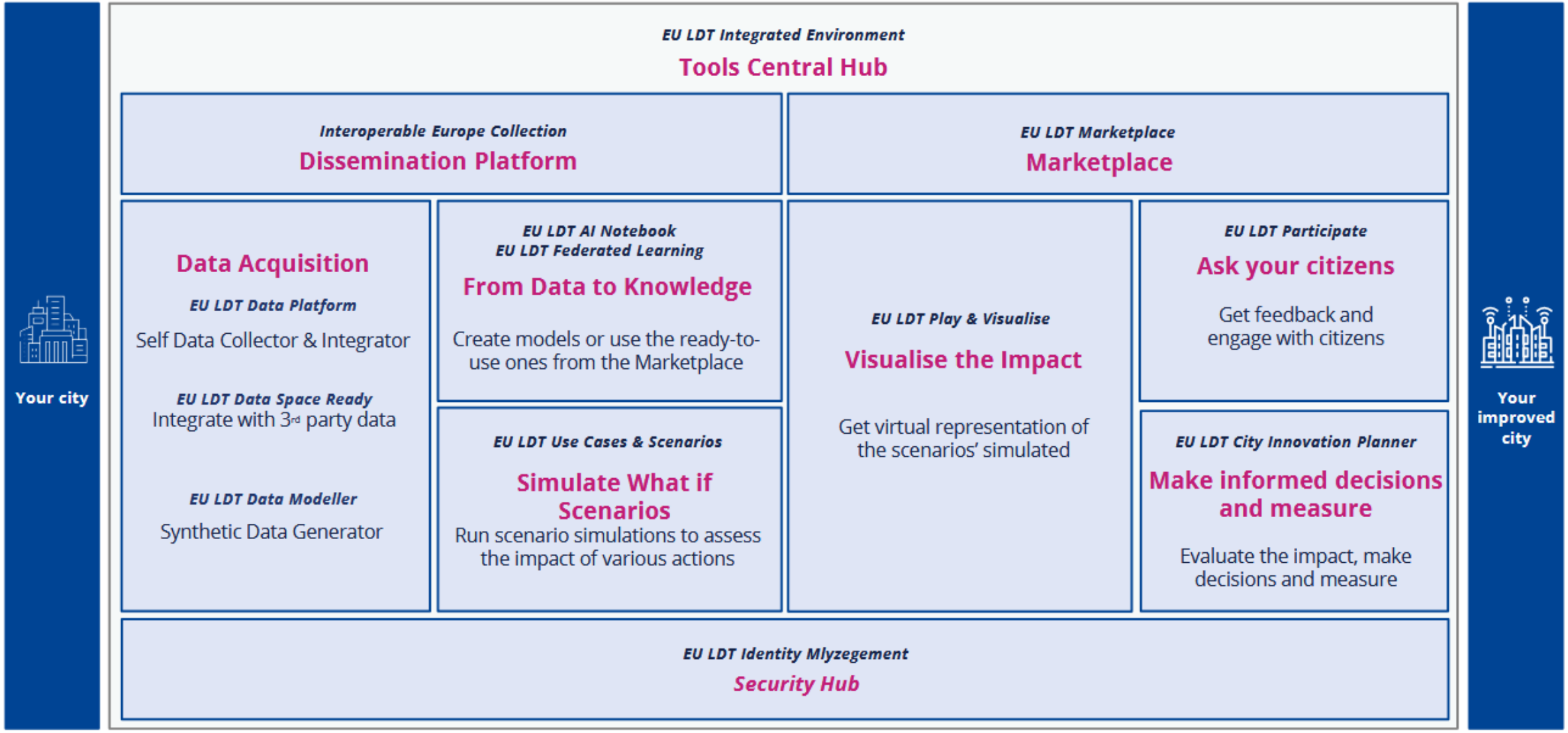
Setting the scene. What is needed to buy?

- IT related vs. not-IT related
- Hardware
- Software
- Data

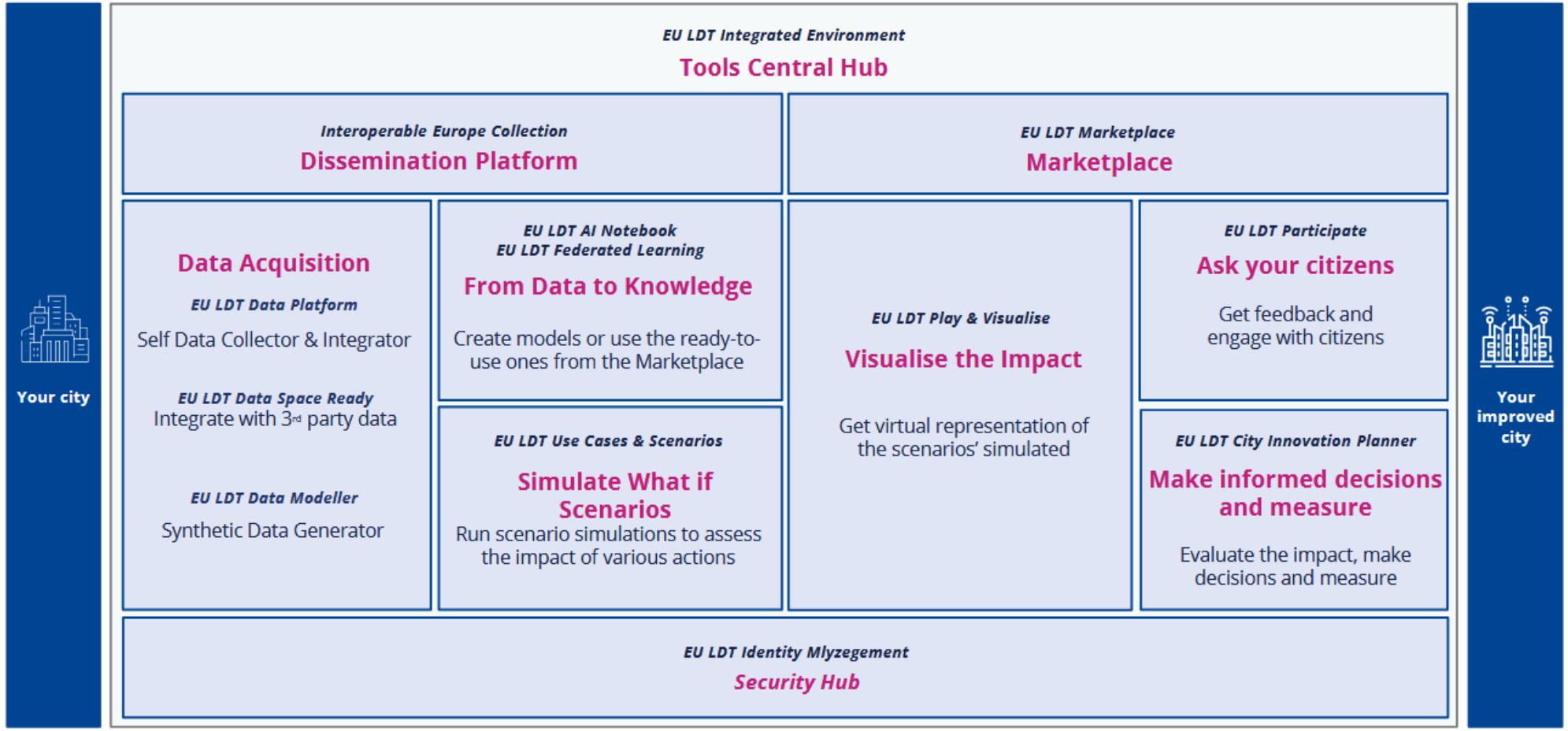
Setting the scene. What is needed to buy?

- IT related vs. not-IT related
- Hardware
  - Data collection
  - Data transportation
  - Data storage
  - Data computation
  - Data visualization
- Software
  - Data processing
  - Data visualization
- Data
  - Own data
  - Third-party data

Setting the scene. What is needed to buy?



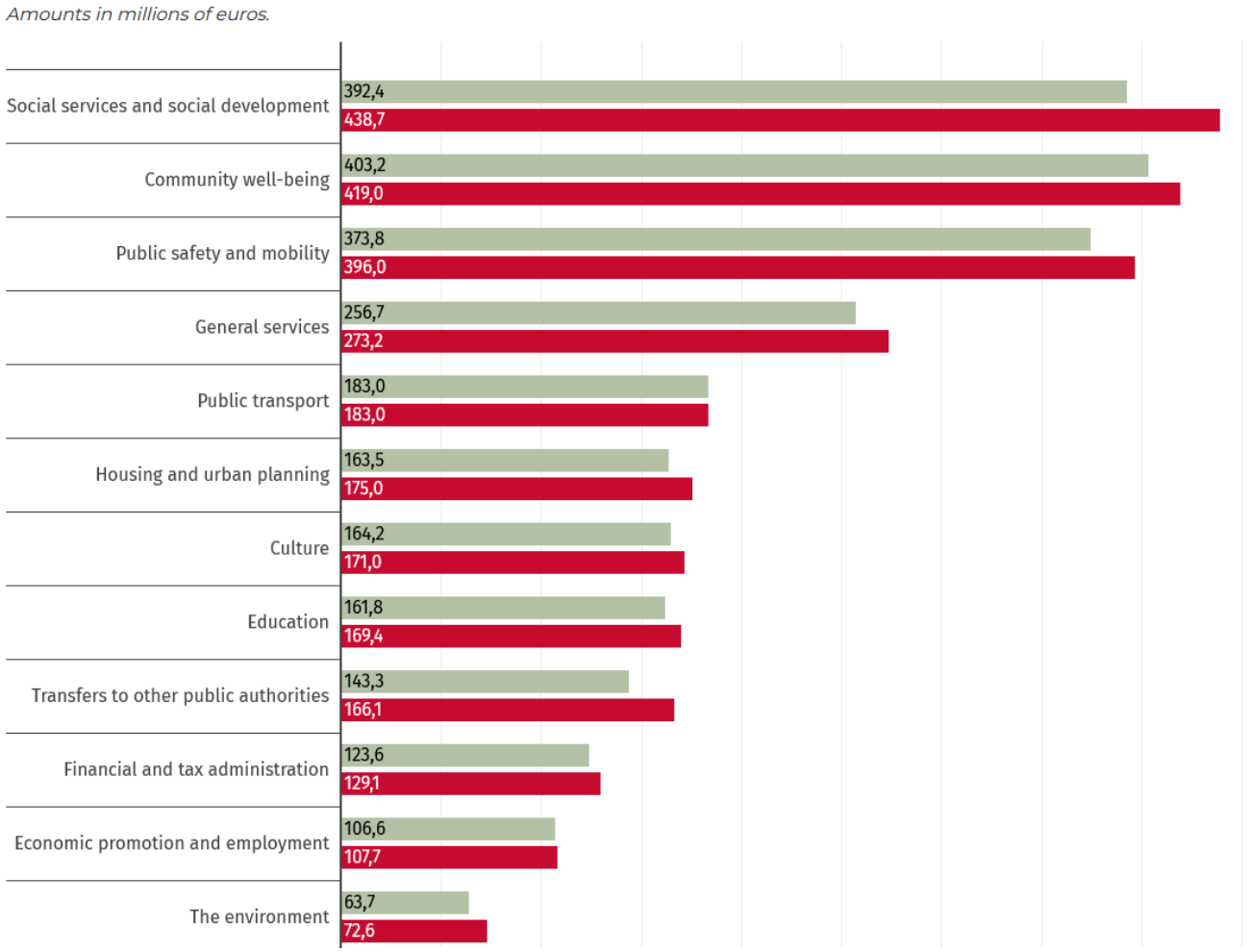
Setting the scene. What is needed to buy?



- + internal knowledge!!

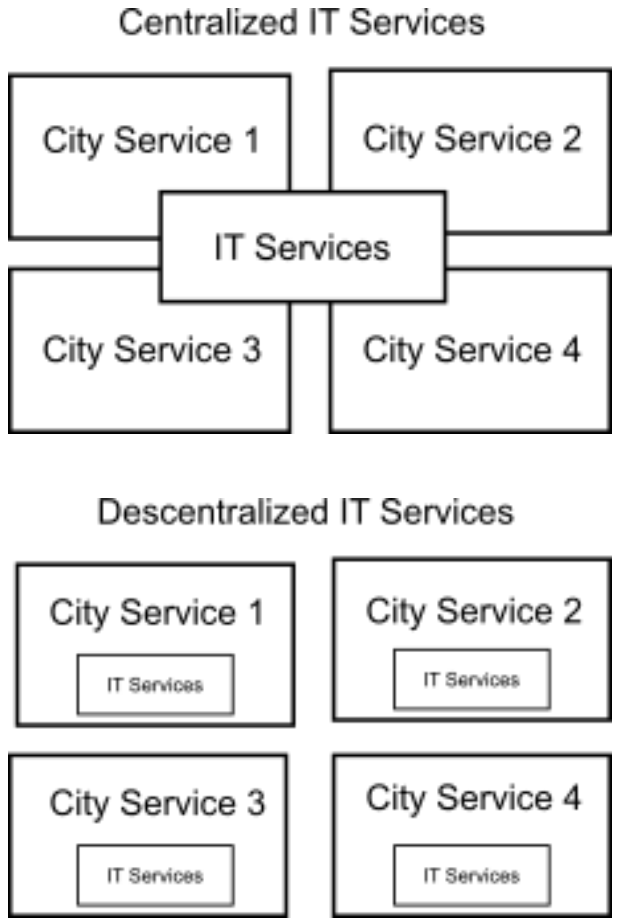
Setting the scene. Who needs to buy?

- City budgets are typically organized by areas/services.
- Often, it is not clear where the IT-related budget is situated.



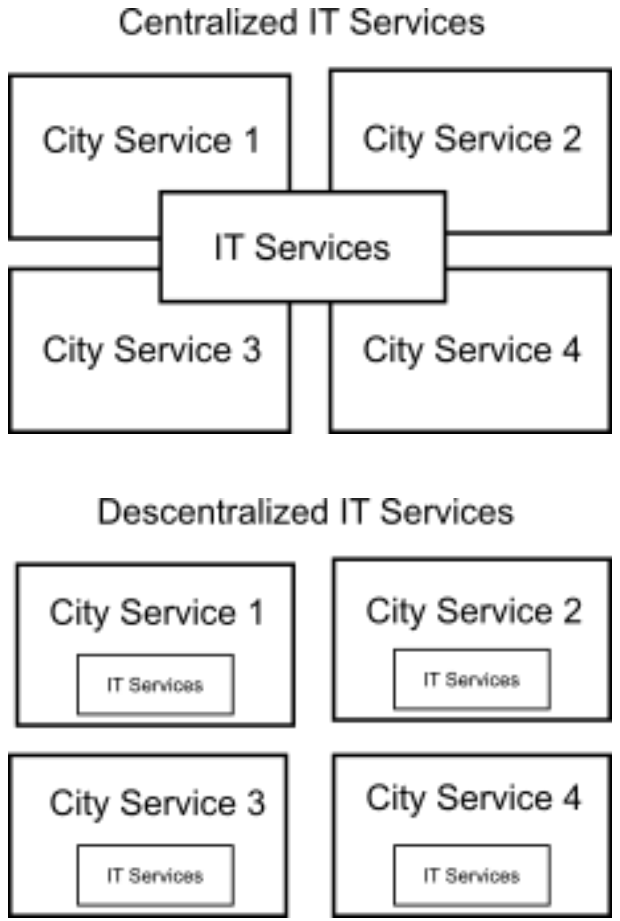
Setting the scene. Who needs to buy?

- City budgets are typically organized by areas/services.
- Often, it is not clear where the IT-related budget is situated.



Setting the scene. Who needs to buy?

- City budgets are typically organized by areas/services.
- Often, it is not clear where the IT-related budget is situated.
- Keep also in mind that city services colleagues should also have knowledge of the use case!



Setting the scene. How should be bought?

- Core principles of public procurement in the EU:
  - Transparency
  - Equal treatment
  - **Open competition (!!!)**
  - Sound procedural management
- General tips on IT-purchases:
  - Avoid lock-in situations. Not only break city data silos but also technology silos.
  - Use well-known and open standardized frameworks as much as possible. *(or directly use open-source solutions?)*

How to procure digital twins. General considerations

- Most city council areas can be positively impacted by the use of urban digital twins.
- Trying to tackle all business cases at once can be risky, especially if the whole framework is not yet deployed.
- The associated computational resources and Return on Investment (ROI) can vary dramatically depending on the business case.
- An incremental approach should be considered, with a strong reliance on a master plan defined at the outset.
- Interoperability should be at the core of the strategy.

How to procure digital twins. Considerations on data collection.

- Use well-known open standard frameworks for data management.
- Consider data security and governance.
- Use as much as possible already existing information.
- Use as much as possible already deployed sensors, or datasets.
- Ensure that sensors planned to be deployed are interoperable.
- If new sensors need to be deployed analyse the public assets property of the city council with connectivity.

How to procure digital twins. Considerations on data processing & visualization

- Processing capabilities:
  - **Cloud vs. on-premise and data governance**
- Re-use as much as possible.
- Integrate as much as possible

How to procure digital twins. What **not** to procure?

How to procure digital twins. What **not** to procure?

- Your own data:
  - Data internally generated
  - Data generated by contractors

15.6. Serveis de dades

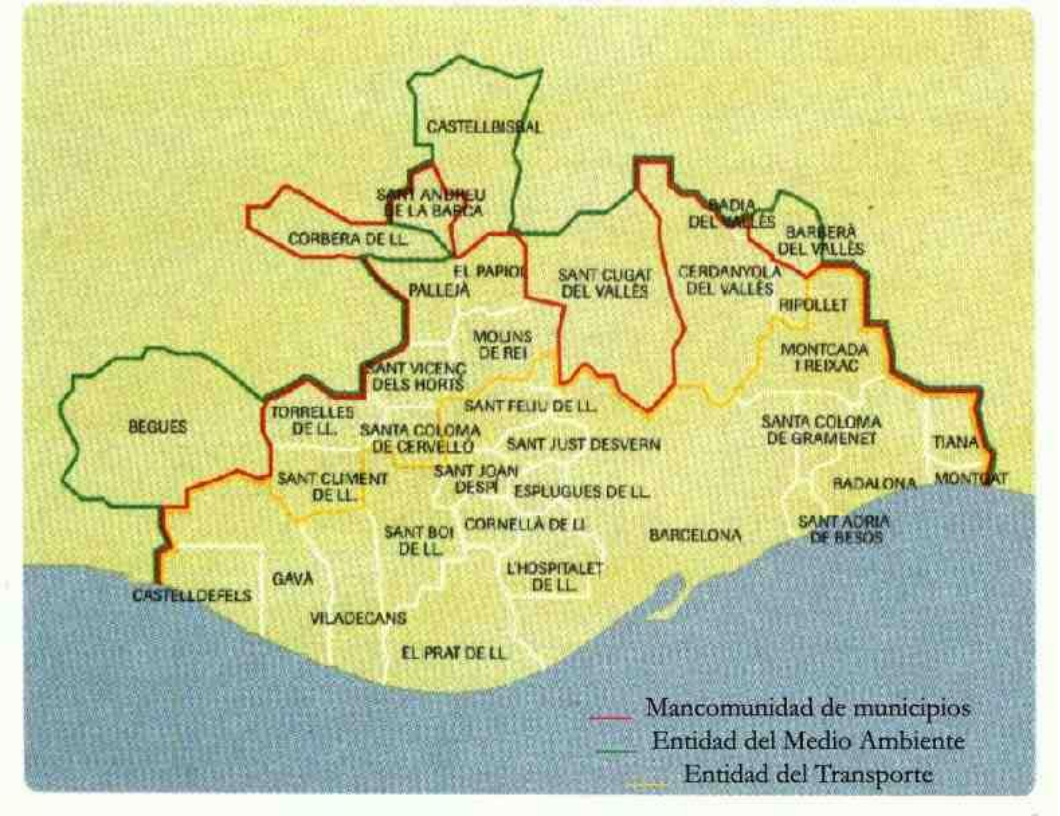
L'adjudicatari oferirà, des de la fase de cohabitació dels serveis definida en la gestió de la transició, accés públic mitjançant serveis de dades web a la informació de disponibilitat de bicicletes i ancoratges a totes les estacions del servei **Bicing 2.0** i proporcionarà, com a mínim, les dades següents:

- Codi d'estació
- Estat de l'estació (operativa / no operativa)
- Coordenades geogràfiques
- Carrer i número
- Altitud
- Bicicletes disponibles
- Ancoratges disponibles
- Estacions properes

Les dades s'hauran de proporcionar, segons la tipologia de petició, en format *JavaScript Object Notation* (JSON) o *eXtensible Markup Language* (XML).

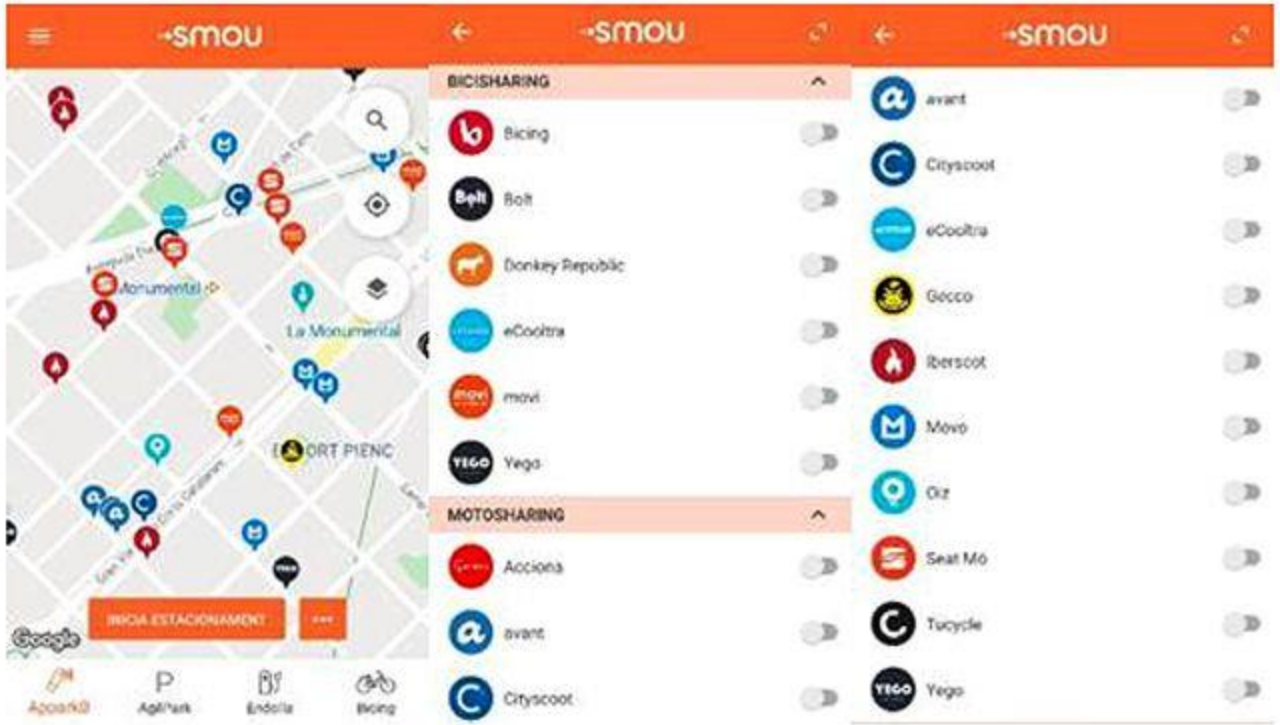
How to procure digital twins. What **not** to procure?

- Data owned by other public administrations:
  - Metropolitan area institutions
  - Regional / national government bodies



How to procure digital twins. What **not** to procure?

- Some third-party data



Examples of architectures

Examples of architectures

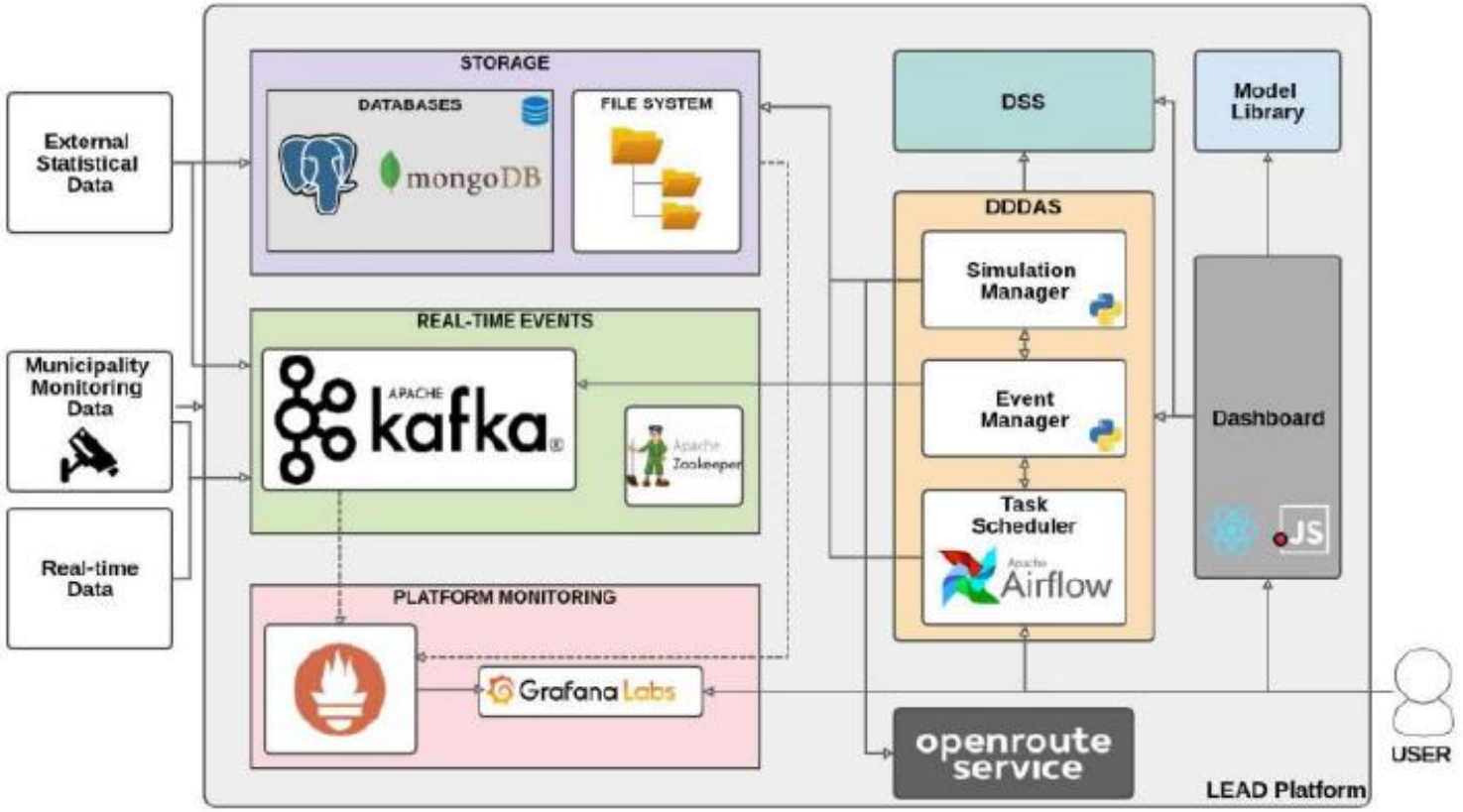


Figure 9:Technology choices for the deployment of the LEAD project

Examples of architectures

EU LDTs toolbox for Smart Cities & Communities

End of the project & public d

Deloitte. Capgemini Intellera consulting TNO

D05.02 Public report on the LDT Toolbox detailed specifications requirements

CNECT/2022/OP/0098 – Procurement of the Technical Specifications for the Twins (LDTs) Toolbox

Source:
https://op.europa.eu/en/publication-detail/-/publication/efca9b7b-3b27-11ee-bd8d-01aa75ed71a1/language-en

Examples of architectures

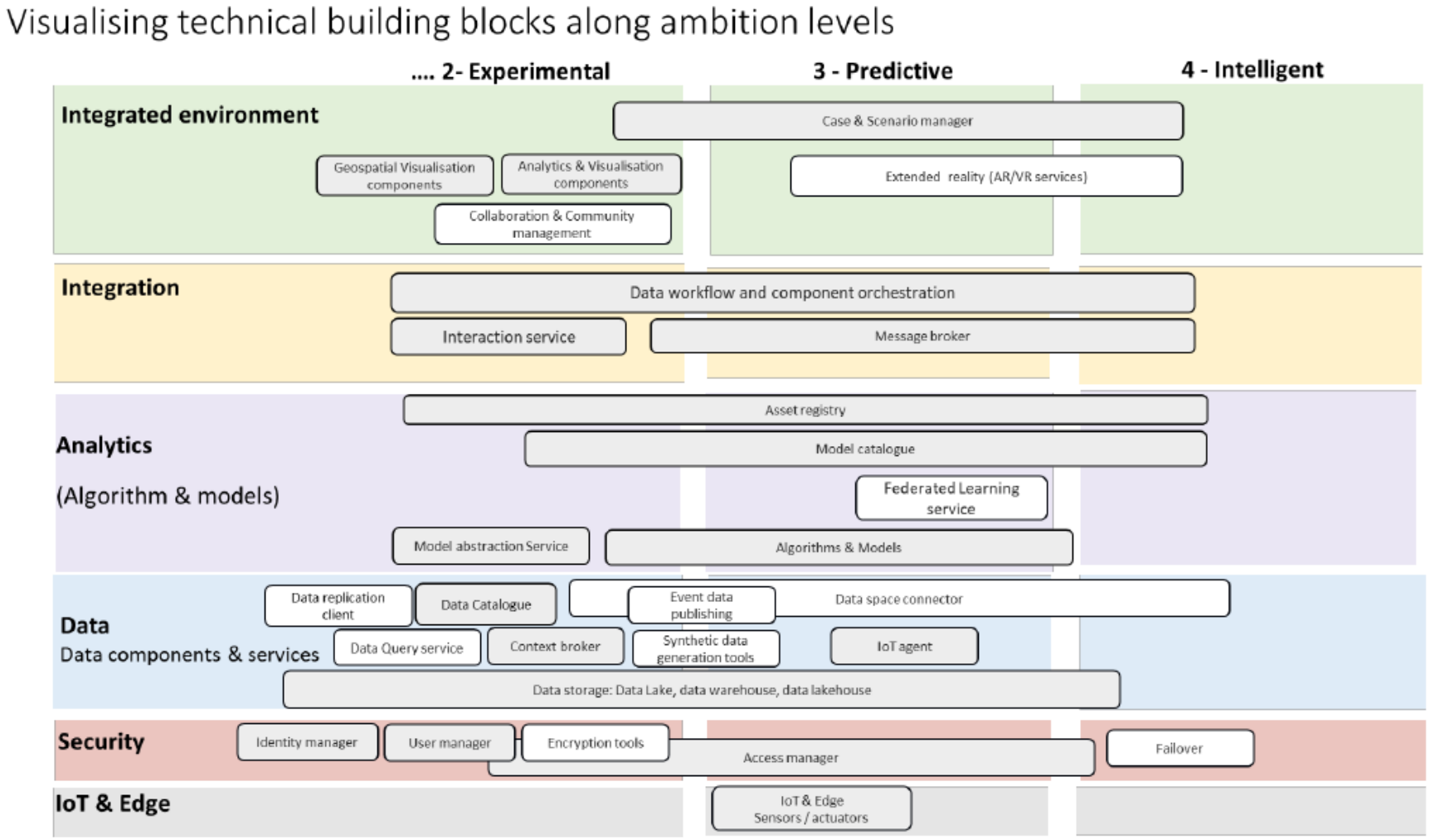


Figure 6: Visualising BBs described in Use case narrative

Examples of architectures

3.2.18 Building Block 18 | Da

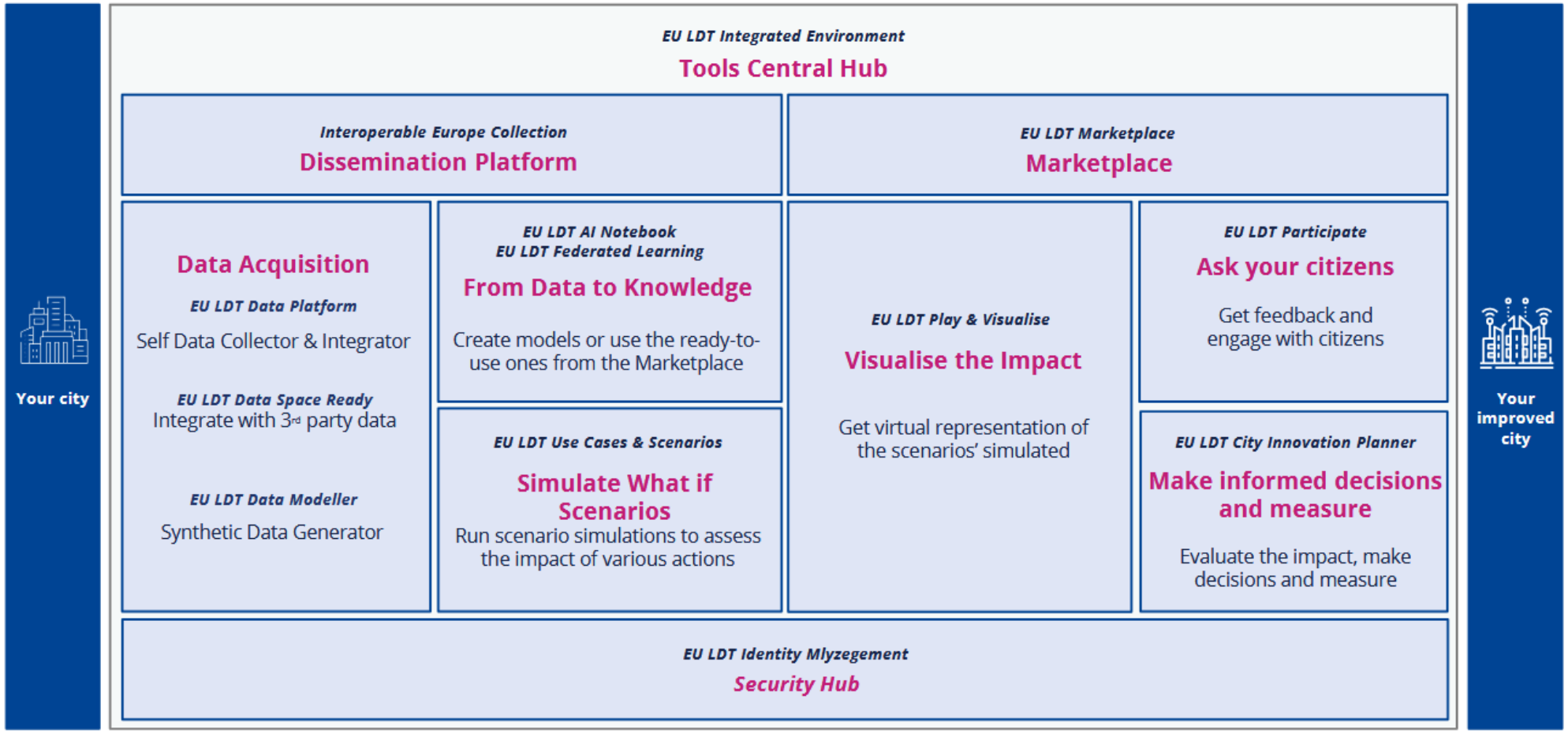
Tab

Minimum Ambition Level	2 – E
Kind	Softv
Maturity Level	Gooc
Internal code	BB.1
Relevant MIM	MIM

Table 70: Capabilities Table of Building Block 18

Ambition Level	Capability Nr	Capability Name	Category	MIM to consider	Standards
2 – Experimental Twins	10	Data storage	Data	MIM2	
2 – Experimental Twins	13	Data processing	Data		
2 – Experimental Twins	5	Data replication	Data		LDES
2 – Experimental Twins	12	Data time travel	Data		LDES, Temporal
3 – Predictive Twins	6	Data transformation	Data		SQL, GraphQL, SPARQL, REST, LDES, NoSQL

Examples of architectures



For more info see: https://interoperable-europe.ec.europa.eu/collection/ldttoolbox

How to procure digital twins. Use case

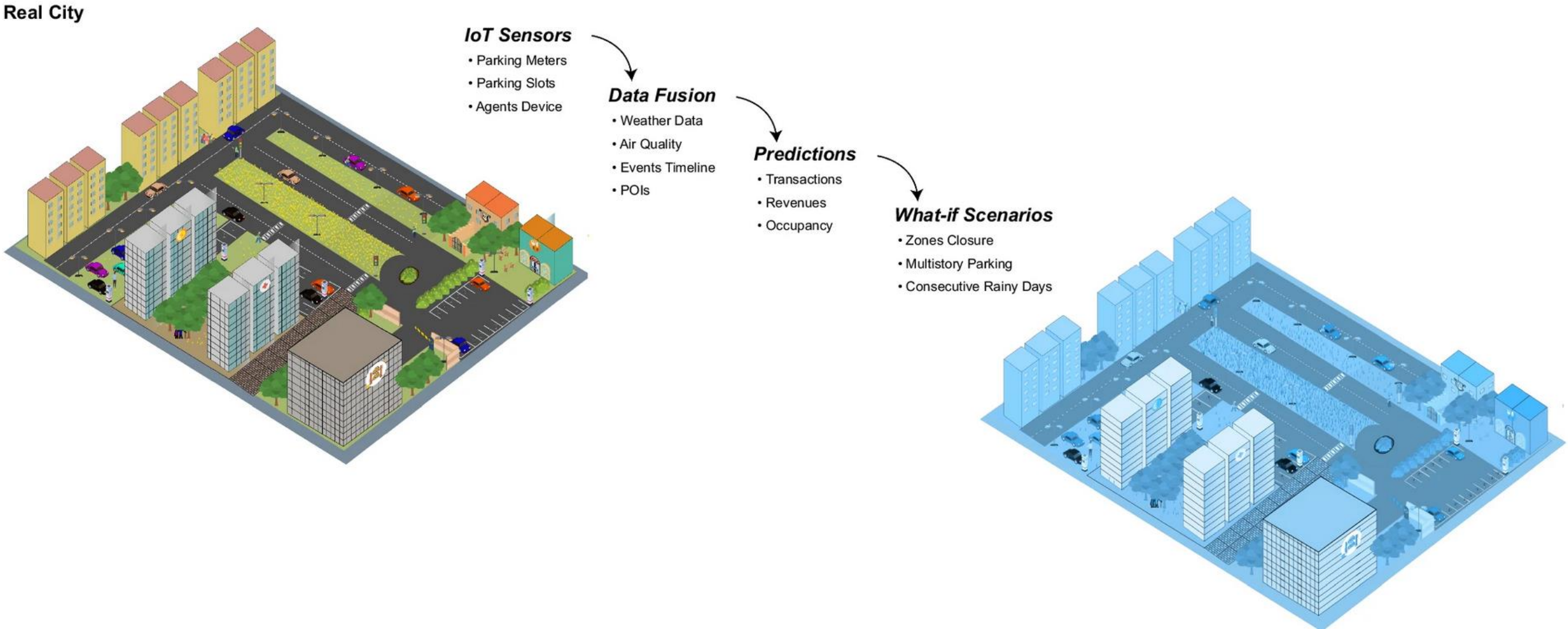
- The telecommunications office of the city council wants to facilitate the access to telecommunication operators to suitable public assets to deploy 5G infrastructure.
  - Data gathering
  - Data processing
  - Data visualization

How to procure digital twins. Use case

- Parking management and mobility forecasting
  - Data gathering
  - Data processing
  - Data visualization

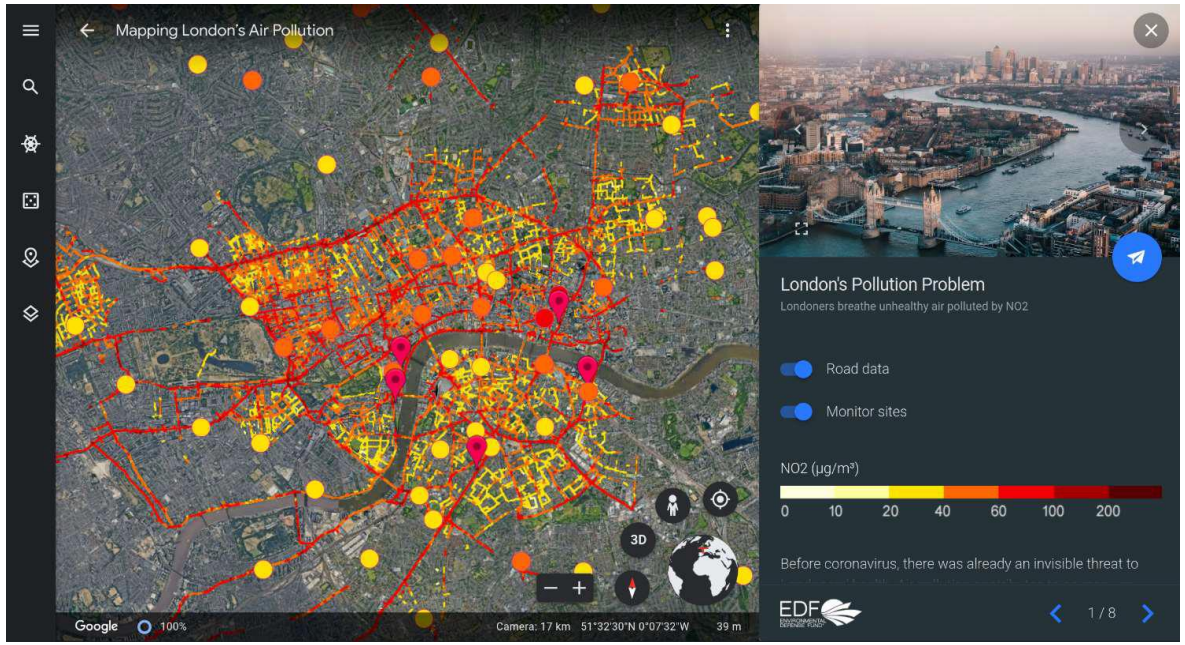
How to procure digital twins. Use case

From: A digital twin framework for urban parking management and mobility forecasting



How to procure digital twins. Use case

- The department of air quality of the city wants to monitor mobility policies to measure their impact on air pollution
  - Data gathering
  - Data processing
  - Data visualization



Thank you