



About

The SPINE Digital Twin Solutions are modular, data-driven tools that create virtual replicas of urban mobility systems to monitor, simulate, and optimise specific domains such as parking availability, intersection traffic conditions, and public bus occupancy levels.

Key Features

Real-time data ingestion and visualization through interactive dashboards.

Simulation and predictive analytics for mobility planning and optimization.

Modular architecture supporting deployment across diverse city infrastructures.

Digital twin solutions

Who will use it:

Target users include city transport planners, public transport operators, municipal authorities, and stakeholders involved in urban mobility and infrastructure planning.

What could be the impact?

Each DT Solution has a different impact on the city's mobility scheme.

Regarding the Smart Parking Management, the target is to reduce traffic from vehicles searching for parking, enhance urban mobility efficiency and user satisfaction and support planning of park-and-ride systems and Mobility-as-a-Service (MaaS) hubs.

For the bus occupancy monitoring solution, the goal is to improve user experience by allowing informed travel decisions, enabling route and schedule optimisation based on demand patterns and encouraging greater adoption of public transport by reducing uncertainty.

Finally, for the Intelligent Intersection Monitoring Solution, the impact would be the increased levels of traffic safety and management efficiency, the support of urban planning through detailed analytics on traffic and automatic identification and monitoring of congestion or accident-prone areas.

Development & testing in SPINE:

Each solution has been implemented and integrated within SPINE Living Labs (e.g., Zilina for intersections, Barreiro for bus occupancy, Valladolid for parking). The DTs are supported by Data Ingestion Pipelines, Data Storage, Computer Vision models, and interactive UI components, and follow a CI/CD and containerised deployment process via Docker Containers.

Can it be transferred?

Yes. Deployment requires access to data sources (e.g., CV camera feeds, sensor data, or vehicle telemetry), container orchestration support (Docker/Kubernetes), and a user interface environment. Solutions are configurable and can be adapted to new cities with minimal custom development as long as there are the necessary sensors deployed.

What's next:

Next steps include refining prediction models, validating with user feedback, extending integrations with other smart city platforms, and scaling deployments to additional SPINE cities. The focus will also be on interoperability and transferability guidelines to support wider adoption post-project.

