

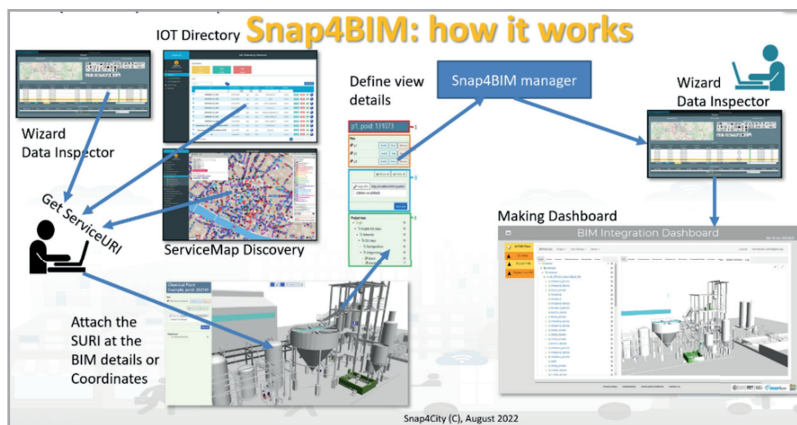


Digital Twin Local and Global

Integration of Urban Modeling with Artificial Intelligence and Simulation

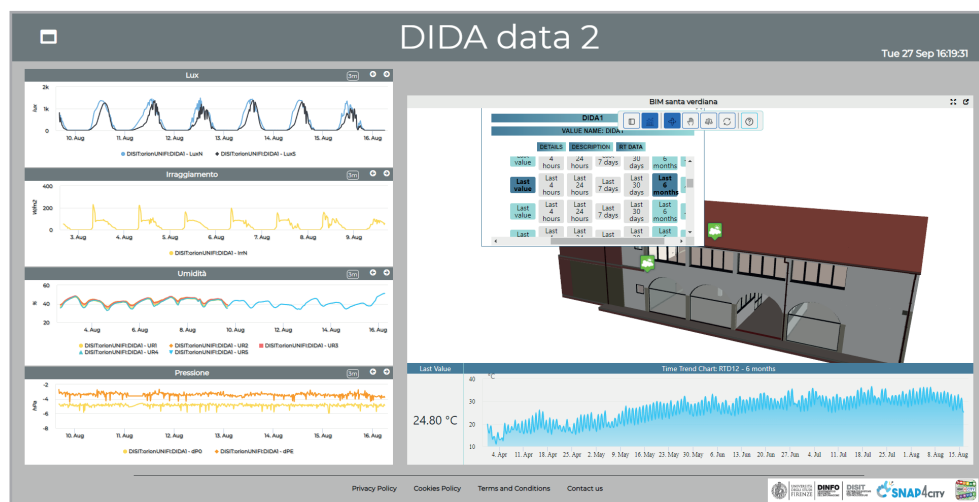
For Digital Twin we intend the integration from physical entities with digital entities. In the context of cities and industries we can have a digital counterpart describing all aspects including data flow, time series, structural details of the design, control aspects, and also 3D shapes to see them in the 3D representation in digital <https://www.snap4city.org/749>. The Digital Twin local refers to local details of a building or of a single machine, while the Global refers to the general view including the modelling of the interaction among the entities. Data, and interaction can be on physical entities and provoke changes in the digital or viceversa, the two worlds should be actually twined, or merged, or better they should be the same thing.

In Snap4City, **Global and Local Digital Twins** are integrated with IoT Device Models, maps, heatmaps, structure, functional, services, and 3D representations, etc. They can be used for making changes into the virtual world and see the action of the physical, or just to apply temporary changes to show them at the stakeholders, thus facilitating the decision making process in close to realistic conditions.

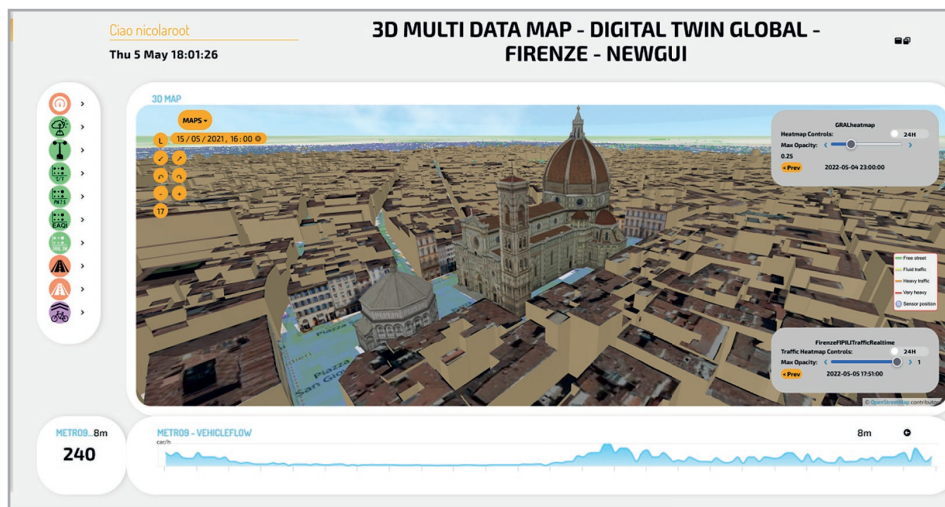


At level of Digital Twin local detailed aspects are modelled in digital of a physical element, for example of a chemical plant with machines, motors, silos, etc., each of them with 3D representation, detailed components, and real-time values of sensors attached which can be used to understand its behaviour in terms of real-time data

and functionalities, mechanical parts to be disassembled for maintenance and inspection, etc. Several different levels of resolutions can be provided and the rendering is typically performed on 3D modelling and visualization tools such as the BIM Manager (<https://www.snap4city.org/730>). The 3D shape is obtained by starting from formats such as IFC, DXF, SVG (Scalable Vector Graphics), STEP, IGES, STL (Stereolithography), OBJ (Wavefront), DAE (Collada), SCAD (OpenSCAD), and IV (Inventor). Some of them are open formats, others are proprietary and a large number of converters are present, even if several problems arise during conversions. The Local Digital Twin has also the detailed description of floors, detailed description of data, devices, etc.

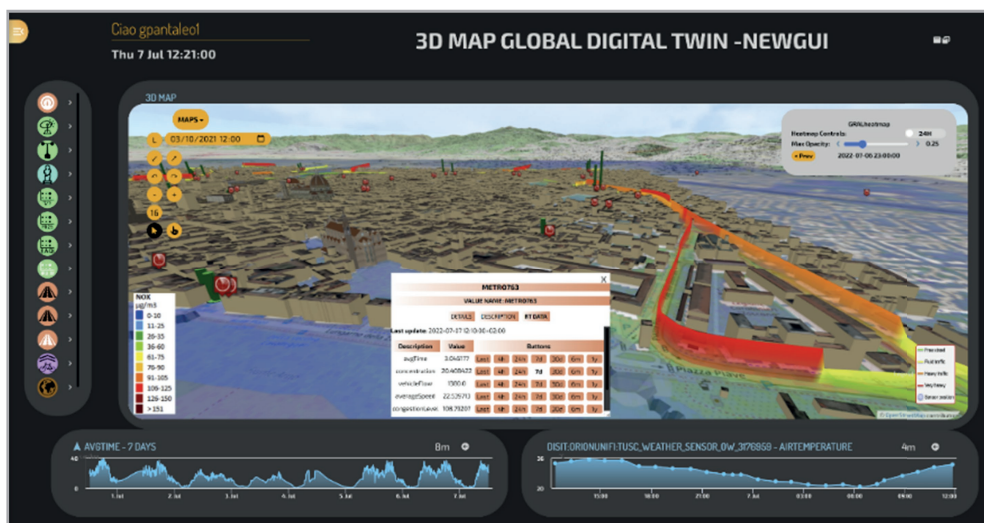


Snap4City provides support for creating Global Digital Twin of the city with integrated Local Digital Twins, it is part of the Dashboard Builder of Snap4City which is 100% open source. It is possible to pass from Digital Twin to the Local Digital Twin such as “entering in the detailed view”. The 3D representation and view of the Digital Twin in Snap4City can manage multiple layers on the map with different levels of opacity.



<https://www.snap4city.org/dashboardSmartCity/view/Baloon.php?iddasboard=MzQzMg==>

Snap4City 3D City Modelling Framework for Smart City Digital Twin is covering more data concerning those addressed in the LoD classifications and includes terrain elevation, roads, building planimetries, maps, orthomaps, heatmaps, buildings, high-value buildings with meshes, building extrude from their plant shape, roof reproduction from LiDAR data, pattern extraction and positioning for roofs and facades, traffic flow data, IoT Sensors/actuators, POI, traffic flows, bus routes, cycling paths, etc.



<https://www.snap4city.org/dashboardSmartCity/view/Baloon-Dark.php?iddasboard=MzQzMg==>

Snap4City provides an efficient and cheap approach for (i) the production process from raw data to 3D Digital Twin elements, (ii) the integrated model for Digital Twin representation and distribution on the web, (iii) the performance in production and distribution of the resulting integrated Digital Twin model. The 3D representation is enriched with: a 3D representation of crests for traffic flows, 3D shapes, and dynamic PINs which can manifest data values for real-time IoT data representation, heatmaps, and animations, picking functionality for building and data elements, and interactivity with all the elements from dashboards.

Extended version accessible from: <https://www.snap4city.org/749>

Contact: <https://www.snap4city.org>

Partners: Snap4City, DISIT Lab

**Global
Digital Twin
for reasoning
on impact
of changes
to the city at
low cost**