

Cybersecurity and Privacy: Snap4City is GDPR (General Data Protection Regulation of Europe Union) compliant, and passed PEN-Test. With Snap4City you can create your certified entities/data, and sequences of events using the provided Blockchain support. End-2-end secure connections are established from devices to dashboards, web user interfaces, including data processing, storage and data analytics. <https://www.snap4city.org/549>. Snap4City is compliant with OpenID Connect, SSO, OAuth, SAML/IdM, European Identity Card, SPID, EU Login, Active Directory, etc. The platform is provided with its report any kind of problem over multiple channels.

Data Integration, ingestion and distribution: Snap4City provides effective and simple to use tools and solutions for fast data ingestion and aggregation exploiting a large range of protocols and standards, and supporting any, real time, push/pull) and High Level Types models for shortening the processes for manipulating simple and complex data such as POI, KPI, IoT Devices/entities, Satellite, Digital Twins, BIM, OD Matrices, Traffic Flows, Heatmaps, 3D Shops/patterns, Typical Time Trends, Color Maps, Trjectories, Flows, Video Streams, TV Coms, CAF events, Routings, User profiles, Digital Terrains, Maps, Othomaps, SVG graphics, scenarios, City Scenarios, Vector Fields, public transport services (GTS, NetEX), 3D buildings, Fires, Payment Profiles, Payment Policies, user profiles, annotations on floors, Floors, etc.

Interoperability: In the large range of smart city solutions, Snap4City is compliant with more than 190 protocols and formats, and it capable to fully interoperate and/or integrate any other system/application. It is highly interoperable with any GIS, BIM, C4M, Satellite Services, OSM, GTS/NetEX, MQTT, NS3, SAML, OPC, OGC, OSM, transport protocols, and IoT Networks protocols (IoT protocols), WoT, smart data models, Data Spaces, services and databases: <https://www.snap4city.org/283>, <https://www.snap4city.org/65>. The interoperability flexibility and modularity of Snap4City together enable the creation of business intelligence applications in a wide range of scenarios and domains.

- Simulations: SUMO, DORAM, Routing, TFR, Flooding, people flow, etc.
- **Development Environment for any vertical, Digital Twin:** City Global and Local, IoT, VR, Visual Programming, business intelligence, CSBL, SSB, Blockchain, etc.
- **Interoperability:** any format, any protocol, any video management system, any sensor, any device, etc.
- **KPI:** multidomain KPI, general management, early warning, early detection of critical conditions, 15MinCityIndex, SDG, etc.
- **Mobile App:** modular applications, operators' modules, multiple cities, etc

SCENARIOS

<https://www.snap4city.org/4>

ORGANIZATIONS

<https://www.snap4city.org/download/video/cov/>

INTEROPERABILITY

<https://www.snap4city.org/65>

APPLICATIONS / PROCESSING

<https://www.snap4city.org/997>

CLIENT SIDE BUSINESS LOGIC

<https://www.snap4city.org/911>

INSTALLATIONS

<https://www.snap4city.org/738>

DEVELOPMENT LIFE CYCLE

<https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf>
<https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual.pdf>
<https://www.snap4city.org/download/video/Snap4City-MLOps-Manual.pdf>

TECHNICAL OVERVIEW

<https://www.snap4city.org/download/video/Snap4City-PlatformOverview.pdf>

SNAP4CITY FIWARE IMPACT STORY

https://www.snap4city.org/drupal/sites/default/files/files/FF_ImpactStories_Snap4City.pdf



TUTORIAL

<https://www.snap4city.org/944>

INNOVATIONS

<https://www.snap4city.org/343>

MOBILE APPS

<https://www.snap4city.org/489>

ARTIFICIAL INTELLIGENCE

<https://www.snap4city.org/524>

ARTICLES

<https://www.snap4city.org/78>

- Multiple sources: thermal & TV cameras, radar sensors, PAX sniffers, mobile data, Wi-Fi, traffic data, mobile phone data, card data, etc.
- **Tourists Flows & Retail Management:** predictions of presences, services' reputations, suggestions on second offer, over-tourism mitigation, notifications, early warning.
- **KPI:** 15MinCityIndex, energy vs people, over-tourism, accepted suggestions, precision.
- **Mobile App:** final users services/informing and operators: info into users services/informing and operators: info into engagement, ...
- **Goals:** reduction of emissions and Ec taxation; cost reduction for waste collection; reduction of waste collection impact on mobility
- **Environment Management producing prescriptions:** monitoring, long/short-term predictions, early warning: GHG, emissions, pollutants, aerosol, chemical plants analysis, coastal erosion (blue economy); Traffic Flow impact emissions, emission predictions.
- **Land slide predictions/warning**
- **Waste Management and Optimization:** costs reduction, optimal routing production, pay as you throw, avoiding out of bins, predictions of waste production on bins, dams.
- **Mobile App:** final users services/informing and operators, info Waste for emissions
- **KPI:** SDG, 15MinCityIndex, GOS, costs, CO2, collecting time, Ec KPI, operators, participation, optimal routing, RAEE Collection, ...
- **Horizontal Platform, a decision support system, which may integrate all the above plus: governance, security, asset management, solutions and applications**
- **Goals:** increase quality of Life, quality of services; Decarbonization, Decarbonization, sustainability; increase efficiency and production optimization; Improve accessibility to services: citizens, tourists, commuters, etc.; Improve security/Society of city users, risk reduction; Costs reduction of services; energy consumption reduction; Reduction of emissions and Ec taxation
- **Horizontal homogeneous platform Uniform Technology for any Vertical operation/plan:** mobility, transportation, energy, environment, security, tourism, infrastructure and assets control, optimization; ICT devices, TV Cams, energy consumption, buildings, etc.
- **Asset Control:** ICT devices, VM, clusters, traffic gates, UPS, etc.
- **AI Solutions:** early warning, predictions, simulation, what-if; optimization, MLOps;
- **AI:** Deep Learning, AI, ML, BERT, LSTM/RAG, XAI (Shop/Lime), etc.

SNAP4CITY SOLUTIONS

- **Mobility and transport solutions and applications:**
- **Goals:** decarbonization, decarbonization, costs reductions, improve accessibility to services, improve Security/Society of city users.
- **Operation and Plan:** traffic monitoring, prediction, reconstruction, identification of critical conditions (early warning), dynamic routing, multi-modal routing, city user behaviour analysis.
- **Optimization and what-if analysis:** traffic light plans, traffic infrastructures, reduction of: travel time, waiting time, # stops, CO2 emissions, consume fuel, travel time for tramways and buses.
- **Public Transport:** Analysis of Mobility Demand vs Offer of Transportation (SUMO, DORAM2)
- **Sharing / Pooling Management:** eShare and mobile app, bike-sharing, smart bike, fleet management.
- **KPI:** SUMO/SUMO travel time, emissions, traffic status, accessibility, ...
- **Mobile App:** final users and operators: info Mobility, traffic, parking, overparking, ...
- **Energy, vehicles and Building's solutions and applications:**
- **Goals:** Energy consumption reduction; increment of efficiency; areas and building sustainability; improve accessibility to services, security and safety
- **Energy Monitoring:** Building, floors, rooms, recharging poles, cabinets, Community of Energy, Data centres, Energy for Hot / cold, air condition, energy vs temperature and usage, etc.
- **Energy Management:** Predictions, early warning, identification of critical conditions
- **Smart Light Management:** LED/mix, cabinets; lights control vs traffic, lights vs security, energy saving, luminaires profiling, group management, ...
- **Smart Building Management:** consumptions, number of people, communities of energy, photovoltaic plants, sustainability, ...
- **KPI:** Energy consumption, efficiency; light profiling and adaptation; autoclave industrial plants optimization, photovoltaic plant simulation; consumption / usage, energy vs temperature, ...
- **Mobile App:** monitoring, info-recharge, eSharing, booking, ...
- **Tourism, city users' behaviour, services solutions and applications:**
- **Goals:** improve Quality of Life and quality of services; Over tourism mitigation, sustainability; Costs reduction of services; Improve accessibility to services: citizens, tourists, commuters, etc.; Improve Security/Society of city users.
- **People Flow Analysis / Management:** in/out-door, retail, attractions; counting, tracking, flows, origin destination matrices, sentiment, recency/frequency, etc.;

Snap4City provides AI based Digital Twin solutions for city operation and plan in multiple domains. **Snap4City** is a 100% open-source platform used in many cities and areas, includes km4City ontological and semantic model (<https://www.km4city.org>) for interoperability. It is an official FIWARE Platform (<https://www.fiware.org/467>, <https://www.fiware.org/>), compliant with FIWARE Smart Data Models, IoT Data Models, data spaces, and a large range of High Level Types, official EOSC Platform, official Node-RED Library, official E015 API, etc. Snap4City is provided "as a Service" or installed on private and public clouds, and on your premise (from yourself, as well as using a number of Snap4City certified companies), no licence fee is needed. Several other installations and services have been performed in multiple cities and areas. See for a large list and for updates: <https://www.snap4city.org/4> and/or <https://www.snap4city.org/download/video/cov/>, installed Snap4City platforms <https://www.snap4city.org/661>.

From security and privacy aspects, Snap4City is GDPR compliant, and passed PENTest. With Snap4City you can create your certified entities, and sequences of events using the provided Blockchain support. End-2-end secure connections are established from devices to dashboards. Snap4City is compliant with OpenID Connect, SSO, European Identity Card, SPID, EU Login, etc.

Snap4City Snap4City platform can cope with any data and information covering multiple domains / scenarios (<https://www.snap4city.org/4>) with integrated Digital Twins (CitVerse, LD1, MIMs Plus, etc.), for operational management, simulation, what if analysis, and strategic plan. Snap4City offer a number of Verticals and Applications.

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UNIVERSITÀ DEGLI STUDI FIRENZE

DINFO DEPARTMENTO DI INFORMATICA E TELECOMUNICAZIONI

DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB



THE POWER OF ARTIFICIAL INTELLIGENCE AT THE SERVICE OF YOUR OPERATION AND PLAN

OPERATION AND PLAN - CONTROL ROOMS - DECISION SUPPORT SYSTEMS - WHAT-IF ANALYSIS - OPTIMIZATION - APPLICATIONS

HORIZONTAL AI PLATFORM

MOBILITY AND TRANSPORT

SMART ENERGY AND SMART BUILDING

ENVIRONMENT AND WASTE MANAGEMENT

CITY USER'S SERVICES AND TOURISM MANAGEMENT

SNAPADVISOR

BUSINESS INTELLIGENCE - SIMULATIONS - VISUAL ANALYTICS - SYNOPTICS - GRAPHICAL WIDGETS - ANALYTICS

DASHBOARDS, WIDGETS TEMPLATES

PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG 15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...

API - MICROSERVICES - GIS - BPM VIDEO - REPORTS - MAPS - 3D ...

DEVELOPMENT ENVIRONMENT AND METHODOLOGY

- VISUAL PROGRAMMING, ML, AI, HPC
- TRAINING COURSES

EXPERT SYSTEM, KNOWLEDGE BASE SEMANTIC REASONING SMART DATA MODEL IOT DEVICE MODELS, DATA SPACES

BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI OPERATIVE RESEARCH, STATISTICS

VISUAL PROGRAMMING, ADAPTERS DATA FLOWS, WORKFLOWS PARALLEL DISTRIBUTED PROCESSING DATA DRIVEN

SMART CITY LIVING LAB

FULL INTEROPERABILITY, ANY: DATA, BROKERS, NETWORKS AND VERTICALS

NATIVE AND EXTERNAL APPLICATIONS

- Smart Parking
- Smart Light
- Smart Waste
- Smart Energy
- Smart Building
- Smart Tourism
- ...