SNAP4CITY

KM4CITY

Be smart in a SNAP!

LIVING LAB

Snap4City System and Deploy

16 January 2021, Course
https://www.snap4city.org/577

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES

100% OPEN SOURCE

EU GDPR COMPLIANT

PEN Test Passed

SNAP4CITY on EUROPEAN OPEN SCIENCE CLOUD MARKETPLACE

SNAP4 Appliances and Dockers Installations

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

scalable Smart aNalytic APplication builder for sentient Cities: for Living Lab and co-working with Stakeholders

https://www.Snap4City.org

Powered by

100% OPEN SOURCE

16 January 2021, Course
https://www.snap4city.org/577

Paolo Nesi, paolo.nesi@unifi.it
https://www.Km4City.org
https://www.disit.org

DASHBOARDS AND APPS – CONTROL ROOMS – DECISION SUPPORT SYSTEMS – WHAT-IF ANALYSIS

EXPERT SYSTEM
KNOWLEDGE BASE
STORAGE

BIG DATA ANALYTICS
ARTIFICIAL INTELLIGENCE
BUSINESS INTELLIGENCE
MACHINE LEARNING

DATA FLOWS, WORKFLOWS
MICROSERVICES
MANAGEMENT

METHODOLOGIES
COURSES AND COMMUNITY
LIVING LABS
DEVELOPMENT TOOLS

Powered by FIWARE

SNAP4 Appliances and Dockers Installations

FREE TRIAL

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INDUSTRY 4.0

AGRICOLTURE

ENERGY

ENVIRONMENT

HEALTH

MOBILE

WASTE

TRANSPORT

BUILDING

SECURITY

PARKING

CONTROL ROOM

Snap4City/Industry structure

- The **Snap4xxxx** solution is released in Open Source, VM and Docker with fully support of MultiTenant/multiple-Organizations
  - Each Organization may be configured for a separate environment with a set of Maps, Menus, Users, Data, Dashboards, IOT Apps, MicroApplications, Custom Widgets, Models, resources, open data, etc.

- Https://www.Snap4City.ORG is the main instance of Snap4xxxx solution managed by DISIT Lab. The main documentation is located and updated on Snap4City.org, GitHUB, dockerHub and Node-Red Library. Snap4City.org is where the last tools are tested and news published.
  - Organizations on Snap4City.org have been created with contracts as for *Platform as a Service*, for testing and for providing *SmartCity as a Service* as well as *Industry 4.0 as a Service*
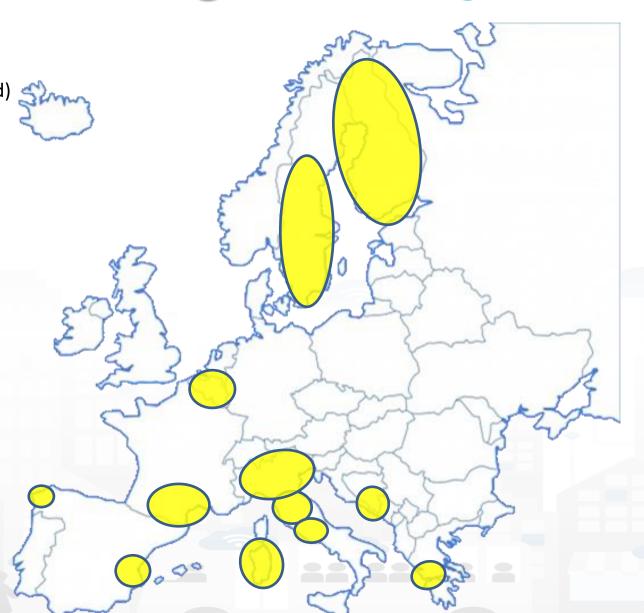
Coverage 2020

Main Organizations/areas

- Antwerp area (Be)
- Capelon (Sweden: Västerås, Eskilstuna, Karlstad)
- DISIT demo (multiple)
- Dubrovnik, Croatia
- Firenze area (I)
- Garda Lake area (I)
- Helsinki area (Fin)
- Livorno area (I)
- Lonato del Garda (I)
- Modena (I)
- Mostar, Bosnia-Herzegovina
- Pisa area (I)
- Pont du Gard, Occitanie (Fr)
- Roma (I)
- Santiago de Compostela (S)
- Sardegna Region (I)
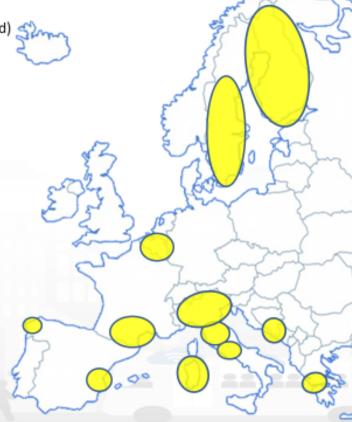- SmartBed (multiple)
- Toscana Region (I), SM
- Valencia (S)
- Venezia area (I)
- WestGreece area (Gr)

Snap4City/Industry Community

- Most of Organizations on Snap4City.org also correspond to companies or institutions that have an installation of Snap4City tools on their Premise,
  - such as: Pisa, SmartGarda Lake, Snap4, ALTAIR, etc.
- This double way allows them to:
  - test the news,
  - share experiences with other groups,
  - get visibility,
  - work in the collaborative environment, and
  - be better supported by Snap4City.org and DISIT Lab personnel.
- Each instance of Snap4xxxx solution *can decide to join the federation* of SmartCity API to exploit shared data.
  - This allows to exploit regional data for city installations applications (web, mobile, dashboards, etc.) without reloading them for example.

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Snap4City (C), October 2020

How to adopt Snap4City
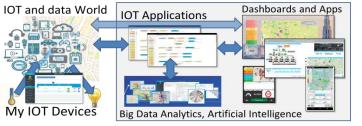

Https://www.snap4city.org

On your premise

Smart City as a Service

- Supporting Org
- 100% Open Source Platform: Github
- Further developments
- Publishing Appliances and Dockers
- Training courses, docs
- Consulting
- Forums
- Etc.

Download and deploy

Installation on your premise

- Virtual Machines or Dockers
- Different configurations
  - From small to scalable
  - Exploiting your legacy tools
  - Interoperable with any tool
- No vendor lock-in, No tech lock-in

Mixed solutions! For example:

- Start on Cloud as Smart City as a Service
  - Migrate on premise on the fly
- Start on Cloud into a sand box
  - Pass to install on premise what you need

On Line Training Material (free of charge)

what	1st part (*) General	2nd part (*) Dashboards	3rd part (*) IOT App, IOT Network	4th part (*) Data Analytics	5th part (*) Data Ingestion processes	6th part (*) System and Deploy Install	7th part (*) Smart City API: Web & Mob. App
PDF							
Inter active							
Video1	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube
Video2	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube
Video3	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube	▶ YouTube
Video4	▶ YouTube	▶ YouTube	▶ YouTube	none	▶ YouTube	none	none
duration	2:55	3:16	3:41	2:00	2:48	2:35	1:47

Free Trial

- Register on WWW.snap4city.org
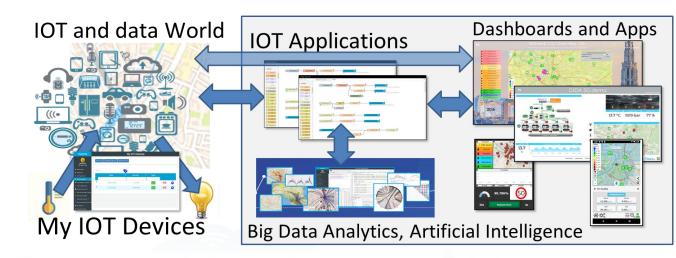 - Subscribe on **DISIT Organization**

- **You can:**
  - Access on basic Tools
  - Access to a large volume of Data
  - Create Dashboards
  - Create IOT Applications
  - Connect your IOT Devices
  - Exploit Tutorials and Demonstrations

IOT and data World

My IOT Devices

IOT Applications

Dashboards and Apps

Big Data Analytics, Artificial Intelligence

IF you need to go more in deep you can ask us to pass at the next Role becoming full AreaManager with full rights of development, also for Data Analytics, machine learning, etc.
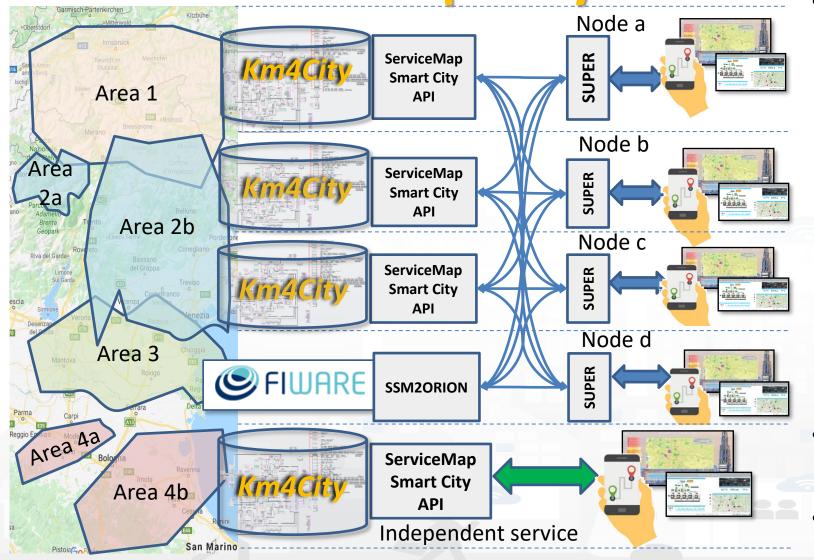
Federation of Snap4City Services

- A Mobile App may refer to one Smart City API Server (for Area 1) via SUPER and receive data from the Federated SUPERS (Area 2) if navigation, queries, etc. are leading to discover out of the addressed KB.

  - SUPER can be used for creating redundant and/or balanced distributed solutions for Federated KB. See Area 2, the two KB in the front.

  - Federated SUPER can have overlapped KB even totally.

  - A Mobile App can be developed to support multiple Smart City API servers, for balancing and

- The usage of Super is not mandatory so that separate services can be produced as well

- Super and Nodes presents the same Smart City APIs.

General Overview of the full Course

- **1st part:** *General Overview*

- **2nd part:** *Dashboards Creation and Management*

- **3rd part:** *IOT Applications development, IOT Devices, IOT Networks*

- **4th part:** *Data Analytics, in R Studio, in Python, how to Exploit and Manage Data Analytics in IOT Applications*

- **5th part:** *Data Ingestion, Data Warehouse, Data Gate, IOT Device Data ingestion, IOT App for Data Ingestion, etc.*

- **6th part:** *Snap4City Architecture, How To Install and Manage Snap4City*

- **7th part**: *Smart city API (internal and external) Web and Mobile App development tool kit*

A number of the training sections include exercitations

Updated versions on: https://www.snap4city.org/577

See also courses in ITALIANO: https://www.snap4city.org/485

6th part Agenda

- GO • **Snap4City/Industry Architecture**
- GO • **Smart City in a Snap, How to become smart**
  - GO – **Smart City Development Life Cycle**
  - GO – **Analysis and Design for Innovation (Co-Creation and Co-Working)**
  - GO – **Analysis for Innovation, the workshops for innovation, co-creation; Data Discovery**
- GO • **Snap4City: Overview of Development Tools**
  - GO – **How to Add Functions that are not present in the Platform**
- GO • **Snap4City/Industry: Smart Solution IOT as a Service vs Consulting and Developing**
- GO • **Snap4City vs Fi-Ware**
- GO • **Snap4City vs State of the Art Solutions**
- GO • **Snap4City Living Lab For Collaborative Work**
- GO • **Snap4City technology for Industry 4.0 → Snap4Industry**
- GO • **Installing Snap4City**
- GO • **The view of the Administrator**
  - – Main menu,. User Management, Auditing, Platform Management
  - – AMMA traffic Analyzer, Data Analyzer, Back Office Platform Scalability
  - – Monitoring Resources and Traffic
  - – Mng. Photos and comments, Mobile App Monitoring, Customer Relationship Management
- GO • **Acknowledgement**

LOGIN

Home / Snap4City - scalable Smart aNalytic APplication builder for sentient Cities

Snap4City - scalable Smart aNalytic APplication builder for sentient Cities

Login

Registration

- **New Registration**
- Request a new password

Search

Search 🔍

-Any- ▾

Tutorials · Scenarious · Innovations · Interoperability · Installations · What People say

Mobile Apps · IOT Devices · IOT Applications · Data Analytics · Dashboards · Living Lab · Smart City API

Smart City Ontology · Articles · SMARTCITY EXPO WORLD CONGRESS 19-21 Nov. 2019 See you at Stand A118 · SNAP4CITY on EUROPEAN OPEN SCIENCE CLOUD MARKETPLACE · SNAP4CITY HACKATHON BUILD YOUR APP FOR A CONNECTED CITY

DINFO DISIT SNAP4CITY
Training Snap4City
from Data to Sentient Cities in a Snap
Program and Interactive Slides

Powered by
www.km4city.org
KM4CITY

FI-WARE
Node-RED

Virtual Assistant

Smart Cities need to set up a flexible Living Lab to cope with the city evolution in terms of services and city users' needs and sustainability. Snap4City solution (https://www.snap4city.org) provides a flexible method and solution to quickly create a large range of smart city applications exploiting heterogeneous data and enabling services for stakeholders by IOT/IOE, data analytics and big data technologies. Snap4City applications may exploit multiple paradigms as data driven, stream and batch processing, putting co-creation tools in the hands of: (i) Smart Living Lab users and developers a plethora of solutions to develop applications without vendor lock-in nor technology lock-in, (ii) final users customizable / flexible mobile Apps and tools, (iii) city operators and decision makers specialized / sophisticated city dashboards and IOT/IOE applications for city status monitoring, control and decision support. Snap4City satisfies all the expected requirements of Select4Cities challenge PCP and much more, and it is 100% open source, scalable, robust, respects user needs and privacy; provides MicroServices and easily replaceable tools; compliant with GDPR; provides a set of tools for knowledge and living lab management, and it is compliant

TOP

Snap4City/Industry: Architecture

Appliances and Dockers Installations

100% OPEN SOURCE

EU GDPR COMPLIANT

PEN Test Passed

SNAP4CITY on EUROPEAN OPEN SCIENCE CLOUD MARKETPLACE

SNAP4CITY — KM4CITY

URBAN PLATFORM: SMART CITY IOT AS A SERVICE AND ON PREMISE

100% OPEN SOURCE

APPLIANCES CONTAINERS

SMART CITY LIVING LAB

- LOCAL GOVERN
- STAKEHOLDERS
- CITY USERS
- IN-HOUSE
- ENERGY OPERATORS
- MOBILITY OPERATORS
- COMMERCIAL OPERATORS
- SECURITY OPERATORS
- INDUSTRIES
- RESEARCHERS
- START-UPS
- ASSOCIATIONS

- GDPR
- SECURITY
- PRIVACY
- ASSESSMENT
- AUDITING
- PENTESTED

- OPEN IOT DEVICES
- IOT EDGE
- IOT GATEWAY
- PAX COUNTERS
- IOT BUTTONS

- TEST CASES, SCENARIOUS, VIDEOS, HACKATHONS
- OPEN SOURCES, COMMUNITY OF CITIES
- TRAINING TUTORIALS, COMMUNITY MANAGEMENT

IOT APPLICATIONS - INSTANT APPS

DATA DRIVEN APPLICATIONS • REAL TIME PROCESSING • BATCH PROCESSING • ANY PROTOCOL & FORMAT

DASHBOARDS & APPLICATIONS

CONTROL ROOM • SITUATION ROOM • OPERATOR DASHBORDS • BUSINESS INTELLIGENCE • WHAT-IF ANALYSIS • DECISION SUPPORT • SIMULATIONS • RISK ANALYSIS • RESILIENCE ANALYSIS

MOBILE & WEB APPLICATIONS

DEVELOPMENT KIT • SUGGESTIONS • MOBILE APPS • MONITORING PANELS • PLATFORM UTILITIES • READY TO USE SMART APPLICATIONS

MICROSERVICES & ADVANCED SMART CITY API

LIVING LAB - DEV TOOLS - COWORKING

IOT DIRECTORY • SERVICE MAP • RESOURCE MANAGER • DATA GATE • R STUDIO • ETL

BIG DATA - DATA ANALYTICS

DATA ANALYTICS TOOLS - MICRO-APPLICATIONS

PREDICTIONS • ANOMALY DETECTION • WHAT-IF ANALYSIS • TRAFFIC FLOW RECONSTRUCTION • ORIGIN-DESTINATION MATRICES • SOCIAL MEDIA ANALYSIS • OFFER VS DEMAND ANALYSIS • ENVIRONMENTAL DATA ANALYSIS AND PREDICTIONS • REAL TIME HEATMAPS • ROUTING • ALERTING • EARLY WARNING • PERSONAL AND VIRTUAL ASSISSTANTS • SMART SOLUTIONS • SMART SHARING • PARTECIPATORY

KM4CITY DATA AGGREGAT KNOWLEDGE BASE - EXPERT SYSTEM OF THE CITY – BIG DATA STORE

IOT MNG - DATA MNG - DATA INSPECTOR – PROCESS MNG – USER ENGAGEMENT – GDPR MNG …

| GIS | CITY UTILITIES | OPEN DATA | LEGACY & EXTERNAL SERVICES | PERSONAL DATA | IOT / IOE | BROKERS | KPI | INDUSTRY 4.0 | SOCIAL MEDIA |

KPI, POI, MyKPI, …

API, External Services

Web Scraping

WorkFlow

Data Analytics,
Artificial Intelligence

IOT Apps

IOT Broker

IOT Broker

IOT Broker

ckan

LD, LOD

GIS

Big Data

Dashboards and Apps

Snap4City Services also on IOT Edge!!!

IOT Networks

IOT Brokers

IOT Gateways

IOT Brokers

IOT Applications

Dashboards and Apps

Big Data Analytics, Artificial Intelligence

IOT Edge Devices

IOT Devices

Mainly fog computing and NGSI V1, V2 with security

Snap4City, Snap4Industry Architecture, V2 (2020)

Back-End ← → Front-End

Data Sources, External Services *PULL Data*

Data Sources, Brokers, External Services *Data Driven, Real Time*

Data Ingestion, aggregation, regularization, reconcile: IOT Directory, NIFI, special tools

Knowledge base Semantic Reasoners

Indexing and aggregating Elastic Search

Federation

Search and Query, Smart City API, Web Socket Server, GIS, Facet, semantic

Data Analytics, Simulations, Special Tools R Studio, Tensor Flow, Python, ...

IOT Applications, Business Logic Node-RED + Snap4City MicroServices

Rendering Acting, Widgets, Synoptics, MicroApps User interface, Drill down, maps, heatmaps

Inform, announce, Act!, warning, alarms, What-IF, ..

Authentication, Authorization, Platform & Processes Management, Data Inspector, Digital Twin, …

Smart City Functional Architecture

Transport systems Mobility, parking

Public Services, Govern, events, …

Sensors, IOT Cameras, Wi-Fi

Environment, Water, energy

Shops, services, operators

Social Media

Social Media Crawler and Manager

Back-End ← → **Front-End**

Data Sources, External Services *PULL Data*

Data Sources, Brokers, External Services *Data Driven, Real Time*

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Standards and Interoperability

Compliant with: AMQP, COAP, MQTT, OneM2M, HTTP, HTTPS, TLS, Rest Call, SMTP, TCP, UDP, NGSI, LoRa, LoRaWan, TheThingsNetwork, SigFOX, DATEX II, SOAP, WSDL, Twitter, FaceBook, Telegram, SMS, OLAP, MySQL, Mongo, HBASE, SOLR, SPARQL, EMAIL, FTP, FTPS, WebSocket, WebSocket Secure, ModBUS, OPC, GML, RS485, RS232, WFS, WMS, ODBC, JDBC, Elastic Search, Phoenix, XML, JSON, CSV, db, GeoJSON, Enfuser FMI, Android, Raspberry Pi, Local File System, ESP32, Libelium, IBIMET/IBE, OBD2, SVG, XLS, XLSX, TXT, HTML, CSS, KNX, Enocean, Zigbee, DALI, ISEMC, Alexa, Sonoff, HUE Philips, Tplink, BACnet, TALQ, Copernicus, IFC, etc. https://www.snap4city.org/65
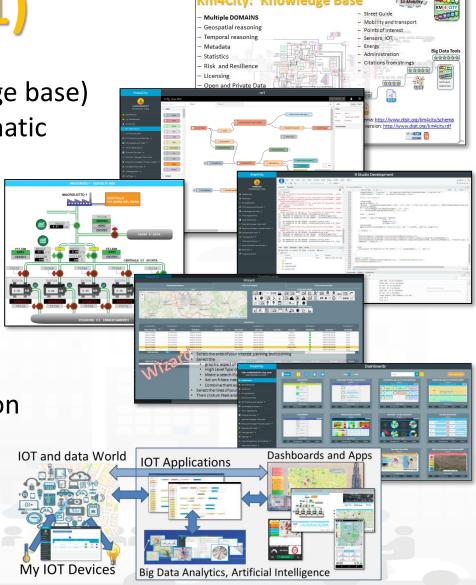
Unique of Snap4City Platform (1)

- Data ingestion and model
  - **Unified data model** (exploited in the Wizard and Knowledge base)
  - **Semantic Reasoner** modelling city entities, supporting sematic search, expert system, digital Twin, etc.
  - **IOT Directory abstracting complexity of IOT Devices, Edge, Brokers**, protocols and data formats
- Data Analytics and Data Processes
  - **Flexible and extensible IOT Applications**
  - **Data Analytic:** multiple programming languages,
- Visual Analytics, dashboarding, Apps
  - **Wizard: expert system** for immediate dashboard production matching data vs graphics representation
  - **Dashboards specialized** multidomain for Smart Cities
  - **Custom Widgets and Synoptics**
  - **Ready to use Mobile App, instant App, MicroApplication**
  - **Strategies** formalization supports
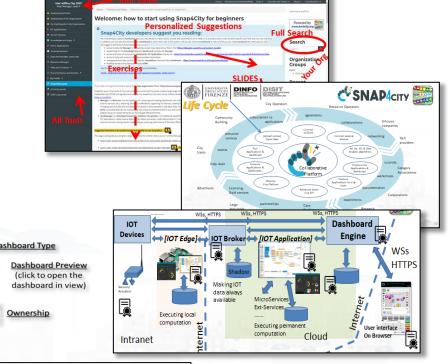
Unique of Snap4City Platform (2)

- Openness to any developers
  - **Living Lab support for coworking, sharing, and delegating**
  - **Advanced Smart City APIs and MicroServices**
  - **100% Open Source, Open hardware**

- Security and Privacy
  - **End-2-end encrypted communication,** on devices, platform, … dashboards
  - **GDPR compliant** privacy/security

- Non functional
  - **on cloud and on premise,** your private installation
  - **On IOT edge and on cloud/premise**
  - **Multitenacy, multiple organization**
  - **Multiple smart solution on a single platform**
  - **Ready to use Appliance** Virtual Machines and/or Containers for a modules and tools, IOT edge, OpenSource code on GITHUB.
  - **Flexible, Modular, Elastic, scalable and robust**

Snap4Industry a Case

Production vs Planning

Real Time Production Synoptic
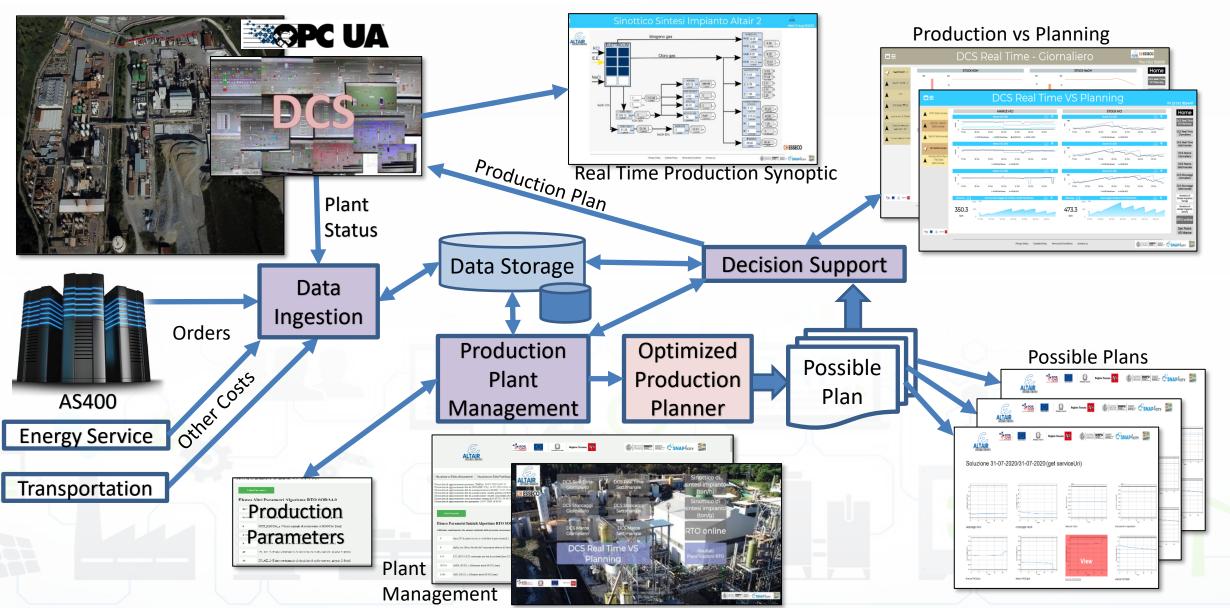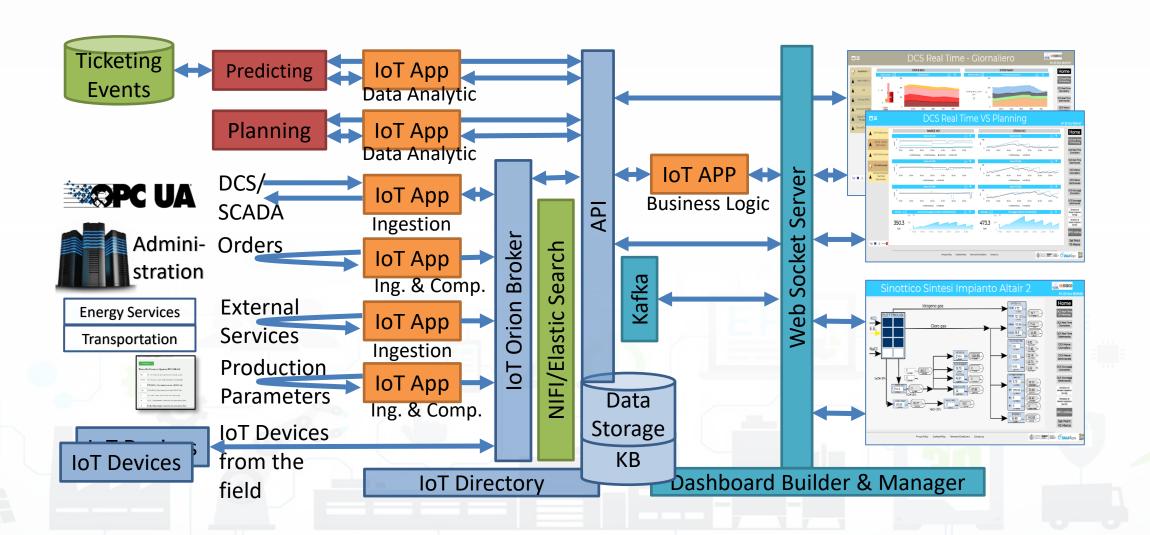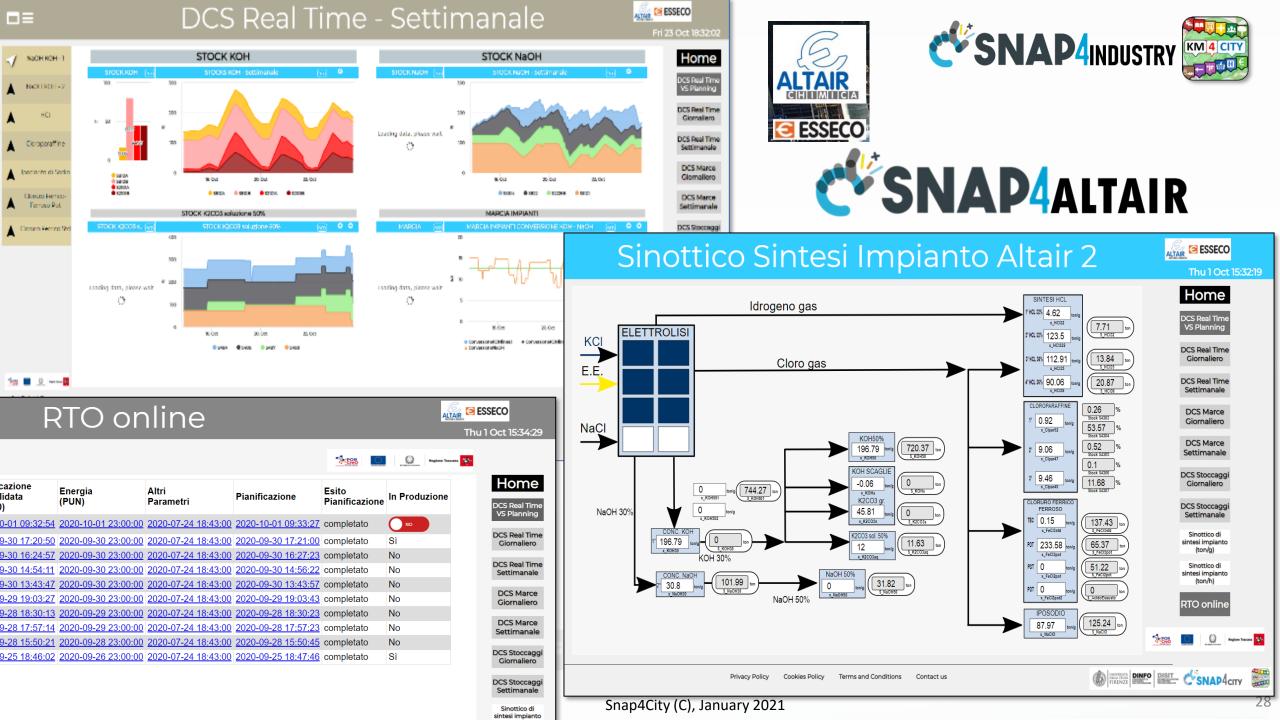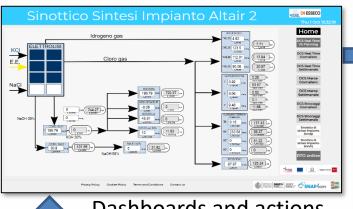
Workflow for Ticket management

Consumptions/productions

Events/actions

Business Intelligence Maintenance

Dashboards and actions

OpenMaint: BPM Workflow management, team assignement, material control, …
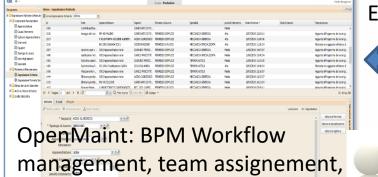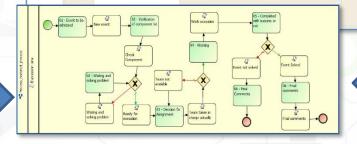
IOT App, Data event firing, event detection and firing Critical event management

TOP

Smart City in a Snap
How to become smart
(short version)

Living Lab Accelerating

GO!

Community Building

SNAP4CITY

Outer ring labels (clockwise from top):
City Operators · Resource Operators · Inhouse companies · Tech providers · Category Associations · Corporations · Research groups · Start-ups · Early Adopters · Large Industries · Advertisers · City Users

Inner ring labels:
collaborations · agreements · networking · tutorials · documentation · workshops · experiments · Help desk · Case Studies · partnerships · Licensing, Gold services · events · hackathons · personal services · subscription to applications

Central cycle (Collaborative Platform):
- Connect IOT/IOE
- Connect external Services
- Data Ingestion and Analytic algorithms
- Advanced Smart City API, MicroServices
- Produce City IOT Applications & Dashboards
- Produce Apps and Dashboards for City Users
- Monitor City Platform
- Promote Applications & Dashboards
- Manage Apps & Dashboards, User Engagement
- Upload context Open Data

Collaborative Platform

RULE OF THUMB

Smart City in a Snap Acceleration for Innovation

- **Organization/City analysis**
  - requirements analysis, identification of domains
  - Snap4City Innovation Process → Report of Scenarios vs Data
  - Data Analysis → Report as Data Table

- **Smart City Design for Innovation:**
  - Design of main Scenarios and Tools (Dashboard, SCCR, Apps, IOT Network, new data, etc.) → Report as Mock-up Design
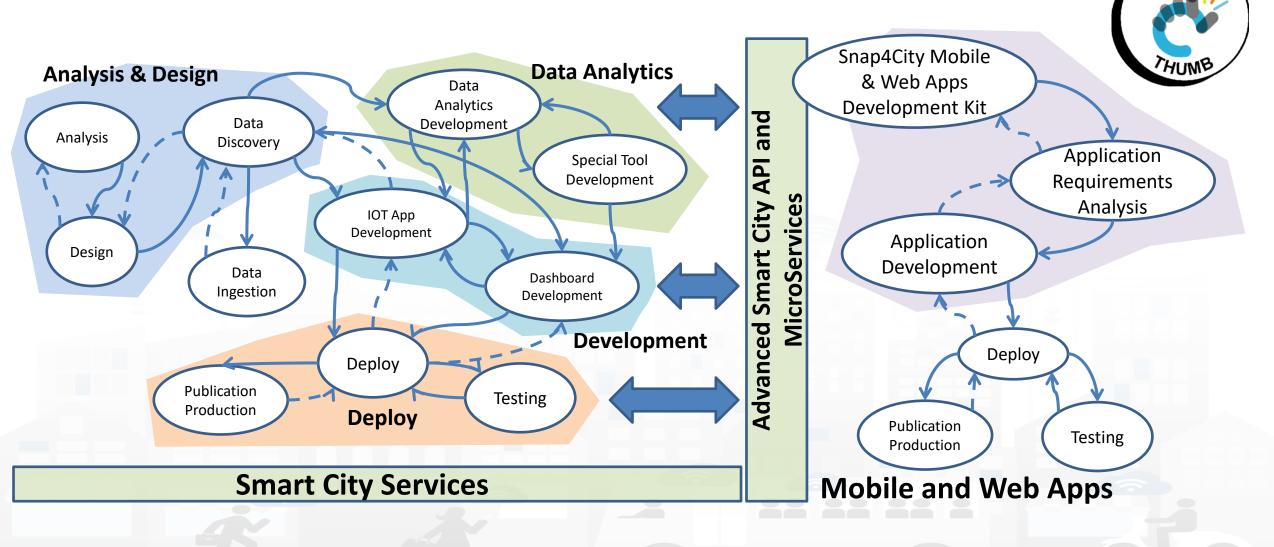
- **Next phases**
  - Data Ingestion and Data Warehouse
  - Scenarios Implementation

Develop Mobile & Web Applications Exploiting Snap4City Smart City Services

SNAP4CITY

Analysis & Design

- Analysis
- Design
- Data Discovery
- Data Ingestion

Data Analytics

- Data Analytics Development
- Special Tool Development
- IOT App Development
- Dashboard Development

Development

Deploy

- Deploy
- Publication Production
- Testing

Smart City Services

Advanced Smart City API and MicroServices

- Snap4City Mobile & Web Apps Development Kit
- Application Requirements Analysis
- Application Development
- Deploy
- Publication Production
- Testing

Mobile and Web Apps

RULE OF THUMB

Smart City Development Life Cycle

Development Life Cycle Smart City Services

Analysis & Design

Data Analytics

Data Ingestion

Development

Deploy

RULE OF THUMB

Development Life Cycle Smart City Services

Analysis & Design

Data Analytics

Analysis

Data Discovery

Data Analytics Development

Special Tool Development

Design

Data Ingestion

IOT App Development

Dashboard Development

Development

Deploy

Publication Production

Testing

Deploy

Development Life Cycle Smart City Services

Analysis and Design

- **Analysis**
  - Requirements Specification
- **Design**
  - In/Out
  - Historical Data
  - Private Info
  - Web Data
  - Functional
  - Analytical
  - Visual Interface

Discovery — Yes
- ServiceMap
- Data Inspector

No

Data Ingestion&modeling
- IOT Directory for IOT Device Regis.
- Data Gate/ETL
- External Services
- MyKPI Modeling
- Web Scraping

Develop. Data Analytic
- R-Studio
- Python
- Java, ...

Dev. Special Tools

Development, Deploy, Testing

Data Flow Development
- **IOT Application Implementation**
  - IOT Directory MS
  - Search/Store MS
  - Ext. Services MS
  - Utilities MS
  - MyKPI, Per. MS
  - WebScraping MS
  - Functional MS
  - Data Analytics MS
  - Dashboard MS IOT App Widgets

Deploy, Testing

User Interface Development
- **Dashboard Builder & Wizard**
  - IOT App Widgets
  - Custom Widgets
  - Regular Widgets

Legenda: phase | Formal Design | Tool/Process | MicroService/Node | Widget

Development Life Cycle Smart City Services

Development, Deploy, Testing

RULE OF THUMB

Analysis and Design

Analysis

Requirements
Specification

Design
- In/Out
- Historical Data
- Private Info
- Web Data
- Functional
- Analytical
- Visual Interface

Discovery
- ServiceMap
- Data Inspector

Yes

No

Data Ingestion&modeling
- IOT Directory for IOT Device Regis.
- Data Gate/ETL
- External Services
- MyKPI Modeling
- Web Scraping

Develop. Data Analytic
- R-Studio
- Python
- Java, ……

new

Dev. Special Tools

new

Data Flow Development

IOT Application Implementation
- IOT Directory MS
- Search/Store MS
- Ext. Services MS
- Utilities MS
- MyKPI, Per. MS
- WebScraping MS
- Functional MS

Data Analytics MS

Dashboard MS
IOT App Widgets

Deploy, Testing

User Interface Development
Dashboard Builder & Wizard
- IOT App Widgets
- Custom Widgets
- Regular Widgets

Legenda

phase	Formal Design	Tool/Process	MicroService/Node	Widget

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Develop Mobile & Web Applications Exploiting Snap4City Smart City Services

Analysis and Design for Innovation (Co-Creation and Co-Working)

Development Life Cycle Smart City Services

Analysis & Design for Innovation

- **Analysis**
  - The analysis starts with a number of meetings/interviews with stakeholders
  - The identification of the target stakeholders/actors/users (target Segments) and their definition/description
  - The meetings/workshops are focused on filling the **Snap4City Innovation Matrix** which is a evolution of the INNOVATRIX approach of IMEC
  - See the schema of the **Snap4City Innovation Matrix** reported in the next slide, on the basis of the kind of Meeting for example: (a) starting a smart city, (b) starting a smart city Living Lab
- **Data Discovery**
  - Production of the Data Table (Snap4City)
  - Data discovery is performed on analysis of the: (i) identified scenarios, (ii) data of the stakeholders, (iii) international sources, (iv) Snap4City experience, etc.
  - Performed by following the Snap4City guidelines on Data Search on web and world.
- **Design**
  - Focused on creating a large number of Use Cases and/or Scenarios for development
  - The design starts by taking into account the Snap4City development life cycles and tools. Thus shortening all the boring activities and following the typical Snap4City rapid prototyping described in these slides!!

Snap4City Innovation Matrix and Process

Analysis for Innovation

Snap4City Analysis for Innovation

- **Analysis**
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  - The identification of the target stakeholders/actors/users (target Segments) and their definition/description
  - The meetings/workshops are focused on filling the **Snap4City Innovation Matrix** which is an evolution of the INNOVATRIX approach of IMEC
  - The schema of the **Snap4City Innovation Matrix** is reported in the next slide,
    - It may be different depending on the kind of action: (a) starting a smart city, (b) starting a smart city Living Lab, (c) both actions at the same time.

- **Two main goals:**
  - Data Discovery (see later)
  - Identification of User Cases, Scenarios (see later)

Innovatrix

- Defined by IMEC for Living Lab according to ENOLL

CUSTOMER SEGMENT		What customer segments to focus on? What are key characteristics? What is the use-context?
NEEDS		What are the needs of the customer segment? How do we prioritize these needs?
CURRENT PRACTICES		Who or what are competitors, alternatives, customer behavior? What are the pains and gains of these current practices?
VALUE PROPOSITION		What (measurable) impact will you create for this customer segment?
SOLUTION		What are the components of your (digital) solution? How do these components differ for the different customer segments?
BARRIERS		What are the barriers for adoption, usage and market entry?
VALUE CAPTURE		What value (monetary and non-monetary) do I receive in return? What price should I set (and how)?
KEY PARTNERS		Who are your key partners? How to interact with stakeholders?

SEGMENT
NEEDS
CURRENT PRACTICES
BARRIERS
VALUE CAPTURE | VALUE PROPOSITION
SOLUTION

Why Innovation Fail….

- https://hbr.org/2006/06/eager-sellers-and-stony-buyers-understanding-the-psychology-of-new-product-adoption

- Many innovate and good products failed on conquering the market/ deploy, due to the psychology of behaviour change.
  - To understand why may fail is the first step.

- One aspects is the ***Psychological bias***:
  - Current users overvalue the benefits of what they are using
    - *endowed effect*, which is estimated to be of the 100%.
      The new should be at least twice better than the current to convince to change.
    - *status quo effect,* if the ownership of the current has been for long time (years)
      it may need a factor of 4 to change.
  - Developers overvalue the benefits of what they have developed, of a factor of 3

Reasons to remain vs change
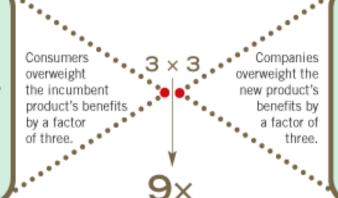
- **Attractiveness of the product**
  - Is subjective as perceived value
- **They compare the new with respect to what they know**
  - Any improvement is a Gain, any lack is seen as a Loss
  - Where losses have a larger appearance of gains
- **Cost to change product in:**
  - Learning, Time and Money
- **Rational vs Irrational impulse to change/buy**
- → *Is a Recipes for a disaster*

THE TRADE-OFFS INNOVATIONS DEMAND

Innovation	What Consumers Gain by Buying	What Consumers Lose by Buying
Electric cars	Clean environment	Easy refueling
Digital video recorders	Easy recording	Ability to play rented movies
DVD rentals by mail	Broad selection	Spontaneity
E-books	Easy portability	Durability
Online grocery shopping	Home delivery	Ability to select freshest products
Satellite radio	Broad selection	Free music
Screw-top wine caps	Less spoilage	Elegance of the experience
Segway scooter	Mobility	Health benefits of walking
Wind turbines	Nonpolluting energy	Unobstructed views

CONSUMERS ARE USUALLY
- skeptical about a new product's performance,
- unable to see the need for it,
- satisfied with the existing product, and
- quick to see what they already own as the status quo.

Consumers overweight the incumbent product's benefits by a factor of three.

3 × 3

9×

Companies overweight the new product's benefits by a factor of three.

COMPANIES ARE OFTEN
- convinced the innovation works,
- likely to see a need for the product,
- dissatisfied with the existing substitute, and
- set on viewing the innovation as the benchmark.

- **Easy Sells/Accept**
  - Acceptance high but new benefits low
- **Sure Failures**
  - Limited benefits and high changes, hard to be accepted
- **Long hauls, a marathon**
  - May be great new value, but associated with big changes. Consumer resistance is high. It may take time to go (e.g., Linux, mobile phones).
- **Smash hits**
  - **Are those that have the major probability to be accepted in short or long term.**
  - High benefits and innovations, with limited changes in behaviour

Degree of product change involved

LOW → HIGH

	LOW	
Degree of behavior change required	**EASY SELLS** Limited product changes and behavior changes	**SMASH HITS** Significant product changes, limited behavior changes
	SURE FAILURES Limited product changes, significant behavior changes	**LONG HAULS** Significant product and behavior changes
	HIGH	

The Workshops for Innovation, Co-Creation

Pre-Conditions

- **Motivations identified**: domains/**thematic-areas**, actors/**segments**,
  - e.g.: Mobility and transport, energy, security, environment, etc.
- The customer **Segments** describe the position of the different *Actors Categories* with respect to the same needs, problem, action, scenario..
  - Two examples:
    - the **Citizens/Tourists** would like to have an overview of what is going on in the area, while the **City Officials** would be afraid to provide too much information since some information can be sensitive to security issues.
    - the **Mobile App users** would have this and that….., and the **City App Provider** would monitor their movements to provide ads, etc.

Schedule of Workshops and activities

- **1st Workshop** finalized to
  - definition of the first version of the **Snap4City Innovation Matrix (Report)**
  - Identification of the **Data Table**

- **Intermediate work on**
  - Knowing the **ICT** infrastructure and viable solutions
  - Refining **Data Table** details by email
  - Improving the **Report** with more descriptive scenarios
  - Presenting **Report** and TABLE 1 week in advance wrt the 2nd workshop (if it is possible)

- **2nd Workshop** finalized to
  - Discussing a reasoned version of the scenarios with problems pending
    - Solving pending aspects of the **Snap4City Innovation Matrix and Data Table**
  - **Identification of the main Scenarios to be developed and feasible according to feasibility and priority**
    - Corresponding consolidation of the development teams

- **Conclusive work on**
  - Refining Data Table details
  - Creating Final Report with Descriptive Scenarios
  - Designing of the Minimum Snap4City architecture to cope with scenarios, scenario feature table wrt to Snap4City modules
  - Development of mock-up for Dashboards with fake data to show the concept

- **Final Meeting**
  - Presentation of the final report with: 1 mock-up of a scenario, early design of the Snap4City solution vs modules according to the scenarios
  - further discussion on the next steps

Snap4City Innovation Matrix ....

	Parameters	Commons	....	....	....
Current State	Needs				
	Current Practices				
	Value proposition (current)				
Future State	Value proposition (Future)				
	Solution				
	Value Capture				
	Key Partners				
	Barriers				

Meeting Organization

Energy & Safety

Mobility and Transport

Security & Resilience

For each table:

- Experts of the domain specific
- Experts of different customers segment
- Operative people
- ICT people
- Decision Makers
- Etc.
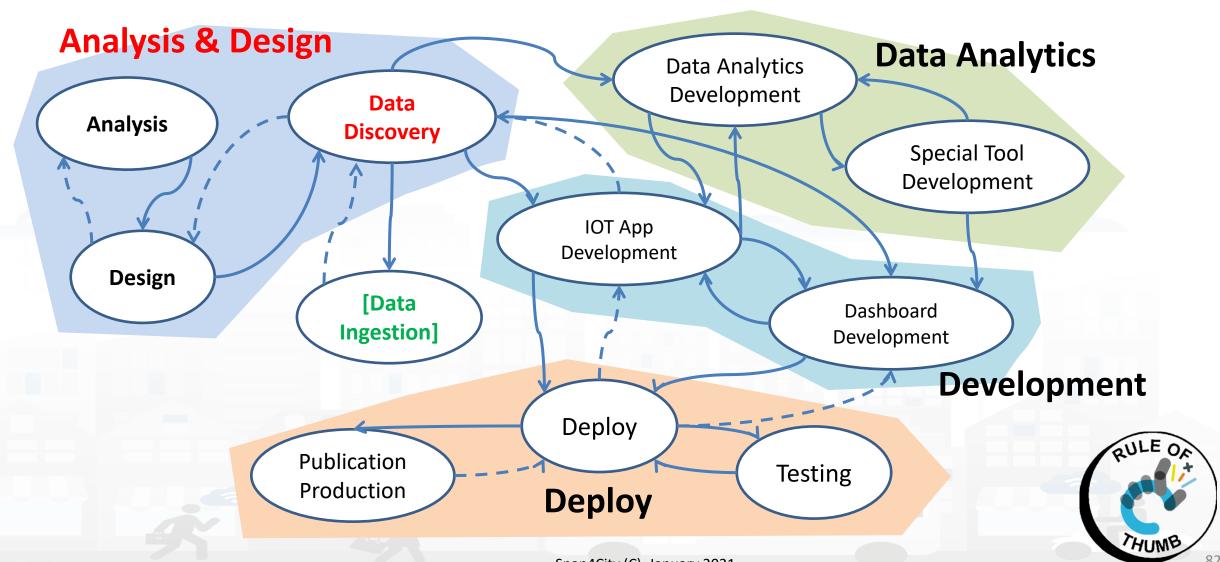
Data Discovery and Analysis

Data Discovery
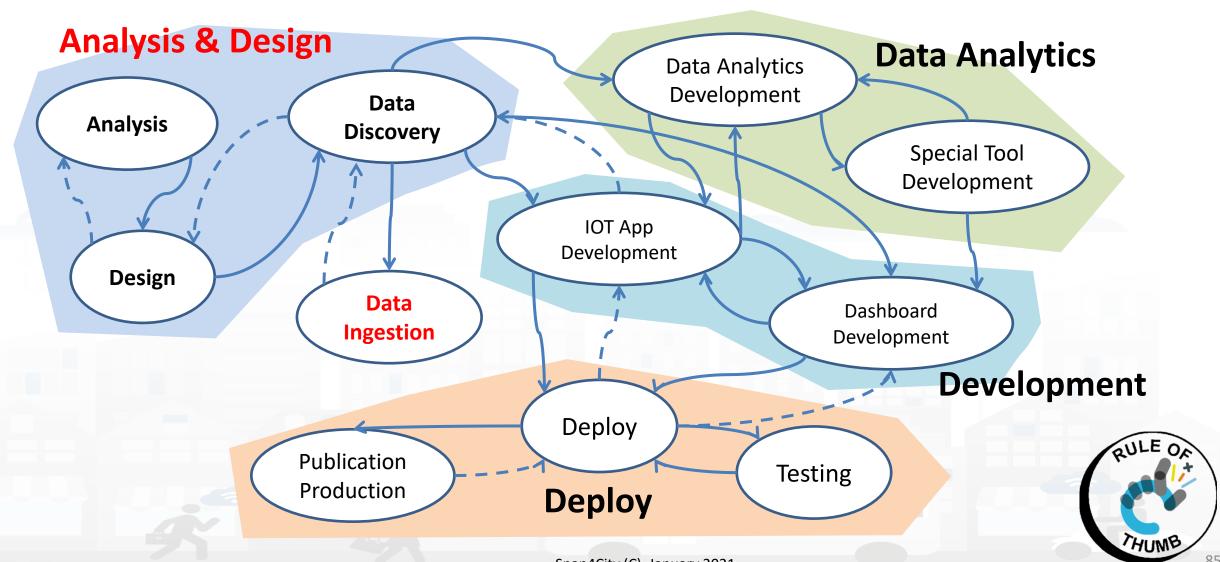
- Performed by analyzing data from:
  - I. identified scenarios from the **Snap4City Innovation Matrix**
  - II. main organizations (via interviews)
  - III. other stakeholders (via interview and web pages)
  - IV. regional, national and international sources:
    - I. open data portals, weather sources,
    - II. IOT networks, etc. via web pages and sites
  - V. Mobile Applications (via Snap4City API)
  - VI. Snap4City portal Https://www.snap4city.org
  - VII. etc.

- Exploiting Snap4City experience, data and tools
- By following the Snap4City guidelines on Data Search on web and world reported in the training course and on Snap4City.org portal.

Development Life Cycle Smart City Services

Analysis & Design

Data Analytics

- Analysis
- Data Discovery
- Data Analytics Development
- Special Tool Development
- Design
- Data Ingestion
- IOT App Development
- Dashboard Development

Development

- Deploy
- Publication Production
- Testing

Deploy
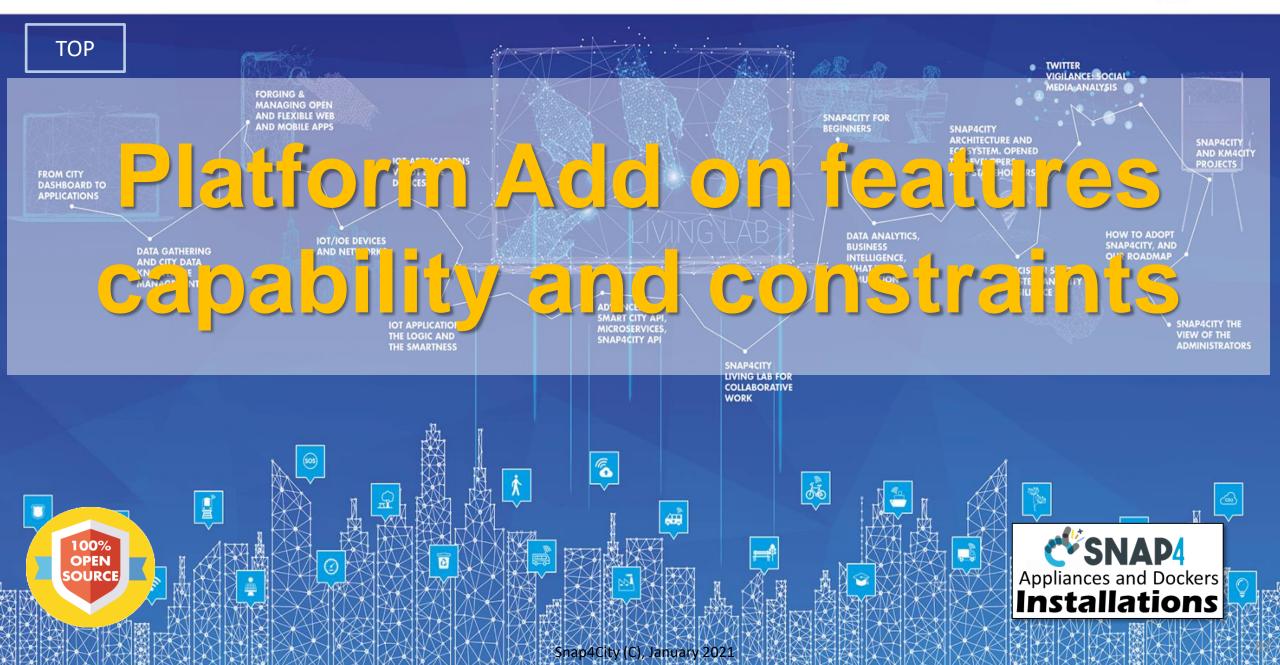
Data Ingestion

- **For Data Warehouse mechanisms (IOT App, IOT Brokers, ==ETL==, DataGate, etc.) and related tools please see slides of the 5th PART of the Snap4City course.**

Adding new Features

- **Dashboard Features** --> Custom Widgets, Widgets
- **Connectors, adapters, IoT protocols, data transformations,** etc. --> by creating new MicroServices, new flows or new IoT Apps ...
- **Applications, Modules** --> for management, for verticals, in the core by using
- **IoT Devices** --> for collecting new data kind or acting on the field
- **Processes** --> Data Analytic of any kind, also exploiting machine learning, gpu, etc.
- **Web and Mobile Apps** --> new end-users services
- **Dashboards**
- **IoT Applications**
- **Data ingestion process**, integration, etc.
- **External Services** to be exploited on Dashboards
- etc. etc.

Adding new Features

- **Dashboard Features** --> Custom Widgets, Widgets
  - they can be created by using the Custom Widget SVG approach
    - TC1.22a: Create and configure a Snap4City SVG Custom Widget for real-time interaction
    - TC1.22b: Create and configure a Snap4City SVG Custom Widget for real-time interaction
    - Custom Widgets: Table explanation, as SVG
    - TC1.26: Use customised SVG pins in a map
    - TC9.19: Custom Widgets / Synoptics controlled by IOT Applications
  - they can be created by developing new elements programming in PHP, JavaScript, Angular, D3, etc..
    - Custom Synoptics and Widgets for Dashboards
- **connectors, adapters, IoT protocols, data transformations,** etc. --> by creating new MicroServices, new flows or new IoT Apps ...
  - https://www.snap4city.org/download/video/course2020/di/
  - HOW TO: Develop an IOT Application for Data Ingestion
  - they have to be in Node.JS, JavaScript according to Node-RED
    - Snap4City Supported Protocols, adding new protocols
    - how to create a flow and nodes in Node-red: https://nodered.org/docs/creating-nodes/first-node
  - They can be automatically created from API rest call
    - TC2.25. Registering external MicroService calling RestCall services, using it on IOT applications
  - business logic behind a dashboard
    - TC9.19: Custom Widgets / Synoptics controlled by IOT Applications

- **Applications, Modules** --> for management, for verticals, in the core by using
  - any language you prefer, preferably exposing API for integration with other modules
    - https://www.km4city.org/swagger/external/index.html
    - https://www.km4city.org/swagger/internal/index.html
  - See Tutorial on how to transform any REST API in a MicroService
    - TC2.25. Registering external MicroService calling RestCall services, using it on IOT applications
- **IoT Devices** --> for collecting new data kind or acting on the field
  - HOW TO: add a device to the Platform
  - HOW TO: Manage IOT Network Components on Snap4City
  - you can add to the platform any kind of IoT Device, with any kind of IoT Protocol
  - You can exploit the open source for Android and raspberry for creating your safely connected IoT device with Snap4City using NGSI V1, V2 and exploiting our secure communication approach

https://www.snap4city.org/692

Adding new Features

- **Processes --> Data Analytic** of any kind, also exploiting machine learning, gpu, etc.
    - see tutorial on Data Analytics
    - https://www.snap4city.org/download/video/course2020/da/
- **Web and Mobile Apps** --> new end-users services
    - https://www.snap4city.org/download/video/course2020/app/
- **Dashboards: Dashboard Builder and Kibana**
    - https://www.snap4city.org/download/video/course2020/das/
- **IoT Applications in Node-RED**
    - https://www.snap4city.org/download/video/course2020/iot/
- **data ingestion process, integration, etc.**
    - https://www.snap4city.org/download/video/course2020/di/
- **External Services to be exploited on Dashboard**s
    - by simply registering their URLs on the portal
    - https://www.snap4city.org/55
- **Workflows**: via OpenMaint
    - TC 1.24 – Integrated Ticketing and Facility Management system
- **BIM models** via Bim Editor for IFC production → Bim Server
    - HOW To: Manage BMP and BIM: main features of openMAINT, BMP, BIM
- etc. etc.

- **new version modules**
  - **to be integrated in the main version,** have to be tested and validated by DISIT Lab. They have to:
    - be in Affero GPL
    - do not affect the functionalities of other modules in negative manner
    - provide the needed quality, in terms of test cases, documentation, etc.
  - **If they are not part of the core**,
    - can be based on proprietary model, and exploit the Snap4City tools via APIs
      - **no constraints**
    - **but forked, they need to te** published version on Internet and linked to main according to **Affero GPL.**

- **Snap4City modules are mainly in Affero GPL**
  - **platform rebranding is not allowed**
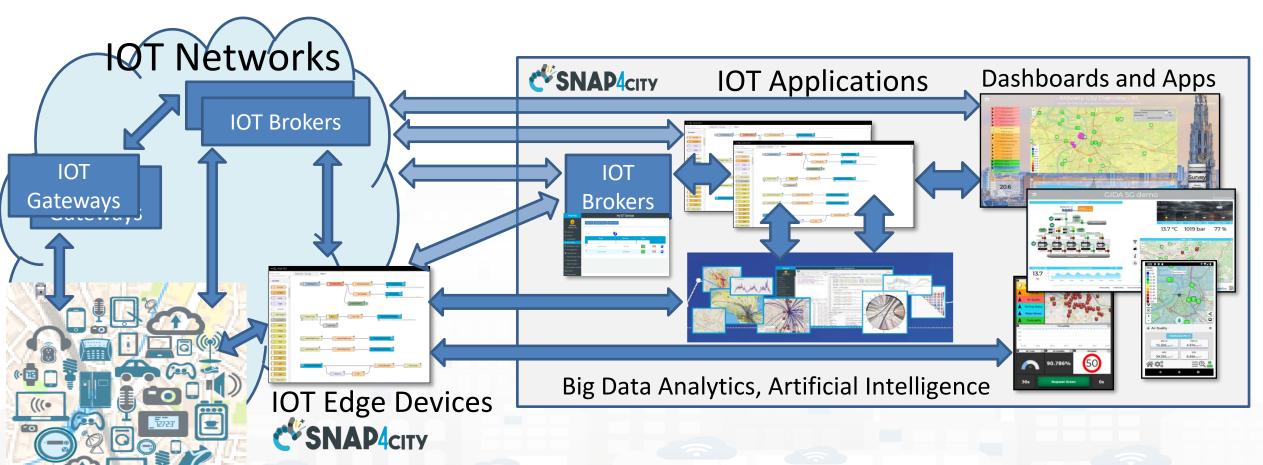
https://www.snap4city.org/692

TOP

Snap4City Overview of Development Tools

Snap4City Services also on IOT Edge!!!

IOT Networks

IOT Brokers

IOT Gateways

Gateways

IOT Brokers

IOT Applications

Dashboards and Apps

IOT Edge Devices

SNAP4CITY

Big Data Analytics, Artificial Intelligence

IOT Devices
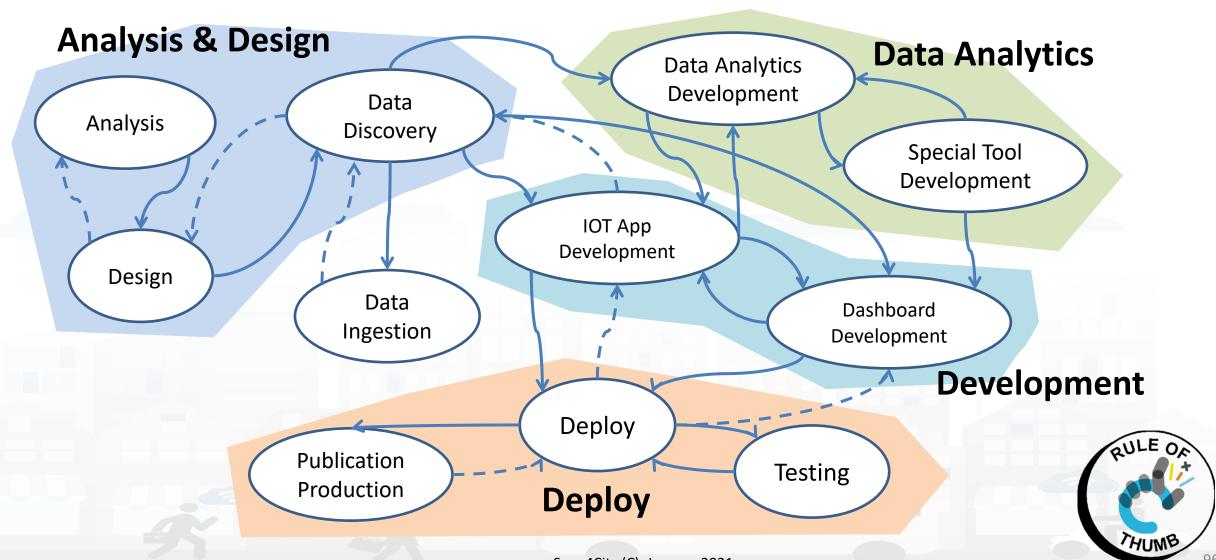
Mainly fog computing and NGSI V1, V2 with security

Development Life Cycle Smart City Services

Any kind of data and flows
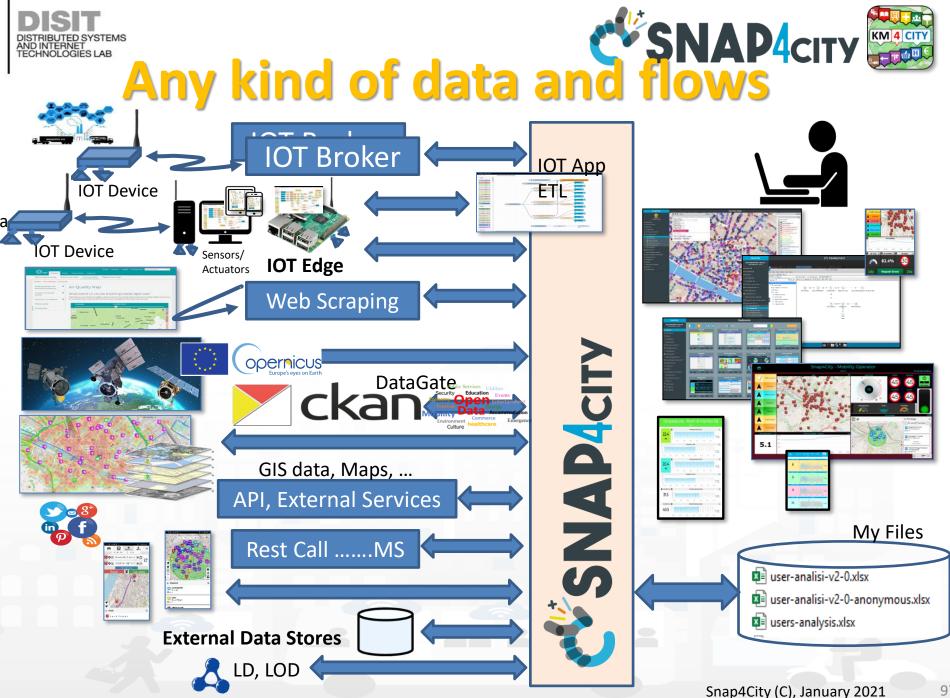
- **Open Data:**
  - Data gate, federation of Open Data Portals
  - IOT App, ETL proc(PULL)
- **IOT Networks:**
  - IOT Application processes, data driven or PULL
  - IOT Brokers (Push) → IOT Shadow
- **Web Pages:**
  - Web scraping, crawling processes
- **Satellite data**
- **Social media: Twitter, Facebook,..**
  - Twitter Vigilance, IOT App
- **Mobile Apps**
  - Smart City API
- **Files upload: CSV, Excel, etc.**
  - IOT Applications, ETL
- **REST API, WS, FTP, LD, LOD, etc.**
  - IOT Applications, ETL
- **Data base accesses**
  - GIS: WFS, WMS
  - ETL, IOT Application

IOT Broker

IOT Device

IOT Device

Sensors/Actuators

IOT Edge

IOT App

ETL

Web Scraping

DataGate

ckan

GIS data, Maps, …

API, External Services

Rest Call …….MS

External Data Stores

LD, LOD

My Files

user-analisi-v2-0.xlsx
user-analisi-v2-0-anonymous.xlsx
users-analysis.xlsx
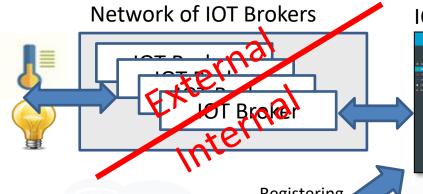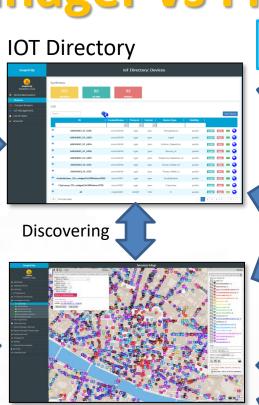
IOT Network Manager vs Final User

Snap4City

roottooladmin1
RootAdmin | ldap

- Dashboards
- My Dashboards
- Notificator
- IOT Applications
- My Personal Data
- IOT Directory and Devices ▾
- Knowledge and Maps ▾
- Micro Applications
- External Services ▾
- Data Set Manager: Data Gate
- Resource Manager: Process Loader ▾
- Development Tools ▾
- Management ▾
- Settings ▾
- User Management and Auditing ▾
- Help and Contacts ▾
- My Profile ▾
- Snap4City portal
- Km4City portal
- DISIT Lab portal

Node-RED

Deploy ▾

filter nodes

input

- inject
- catch
- status
- link
- mqtt
- http
- websocket
- tcp
- udp
- amqp
- amqp2

output

- debug
- link
- mqtt
- http response
- websocket
- tcp
- udp
- amqp
- amqp2

flow1 | Flow 1 | +

- show micro web app
- service-search-near-marker
- world map
- point
- transform results
- world map
- event-log
- popupopen
- msg.payload
- msg.payload
- timestamp
- service-info
- vehicleFlow
- vehicle flow (car/h)
- worldmap
- switch
- pierfrancesco.
- sensor
- timestamp
- last temperature
- Dashboard — connected
- get value
- event-log
- temperature
- Temperature — connected to ws://192.168.1.185:9000/se

IOT Application Editor

info

Flow

Name	flow1
ID	"49a71aa0.b297b4"
Status	Enabled

Information

99

Snap4City

- Dashboards
- My Dashboards
- Notificator
- IOT Applications
- My Personal Data
- IOT Directory and Devices ▾
- Knowledge and Maps ▾
- Micro Applications
- External Services ▾
- Data Set Manager: Data Gate
- Resource Manager: Process Loader ▾
- Development Tools ▾
- Management ▾
- Settings ▾
- User Management and Auditing ▾
- Help and Contacts ▾
- Documentation and Articles ▾
- My Profile ▾
- Snap4City portal
- Km4City portal
- DISIT Lab portal

Prev **1** 2 3 ... 9 Next

Filter 🔍 ✕

Create new

● 2018-09-14T04:44
IOT Edge App
owner: badii
Management

● 2018-09-21T03:19
IOT Edge App
owner: panesi
Management

● 2018-10-19T16:07
IOT Edge App
owner: pb3
Management

● 2018-10-19T17:17
IOT Edge App
owner: pb3
Management

● 2018-10-22T11:57
IOT Edge App
owner: semolarudy
Management

● application
IOT Application
owner: tester5
Management

● Bib APP
IOT Application
owner: semolarudy
Management

● ChargingStations
IOT Application
owner: comunedashres
Management

● Deprecated - SiiMobilityControlRoom
IOT Application
owner: badii
Management

● SamsungGalaxyS4BarCode
IOT Edge App
owner: badii
Management

● esercitazione
IOT Application
owner: tester2
Management

● Iot-App
IOT Application
owner: tester14
Management
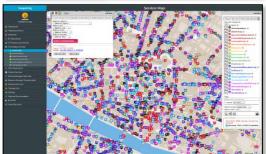
Developing IOT Applications

MicroServices collections

My IOT Applications

IOT App. Editor

Generating IOT App With Dashboard

IOT Discovering

ServiceMap Discovery

Knowledge Base, Km4City
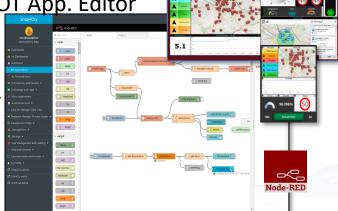
Dashboard Collection, Editor and Wizard

Sharing/saving reusing IOT App

Node-RED

Resource Manager

GitHub
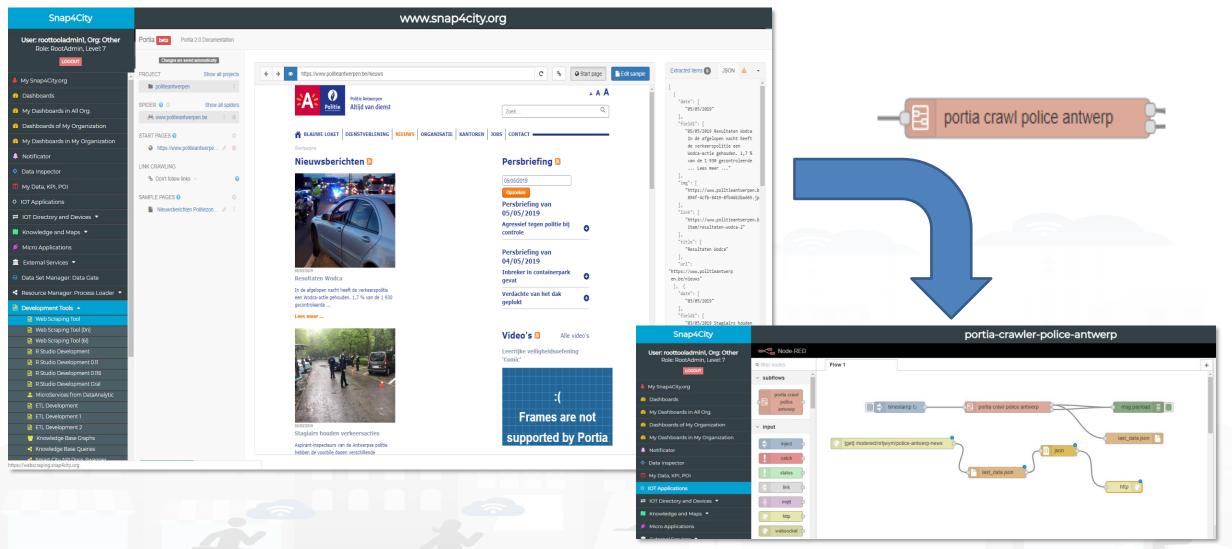
Web Scraping

Web Scraping
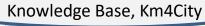
Web Scraper PORTIA

Generating WEB Scraping

My Scraping processes

Knowledge Base, Km4City

Sharing/saving reusing Scraping

IOT App. Editor

Resource Manager
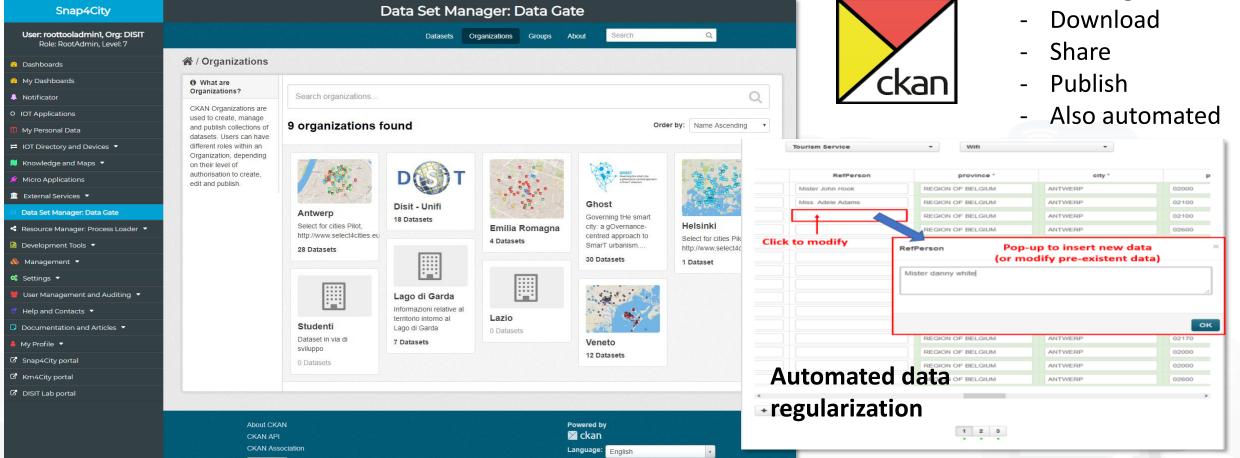
Integrated DataGate/CKAN Static open data ingestion

Federated Crawling
Federated Distribution

Data Set:
- Search
- Loading
- Download
- Share
- Publish
- Also automated

Automated data regularization
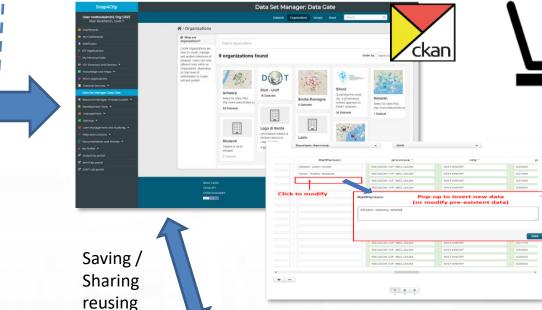
Data Ingestion via Data Gate

Data Gate

Knowledge Base, Km4City

Knowledge and Storage Data
from the Field and City

Saving /
Sharing
reusing

Data Set:
- Search
- Loading
- Download
- Share
- Publish
- Also automated

Federated Network

Data Set: sharing,
Harvesting, Loading/
Downloading

In Yellow alternative & legacy solutions

Batch Processing for dynamic data ingestion

Developing ETL, Data Manager
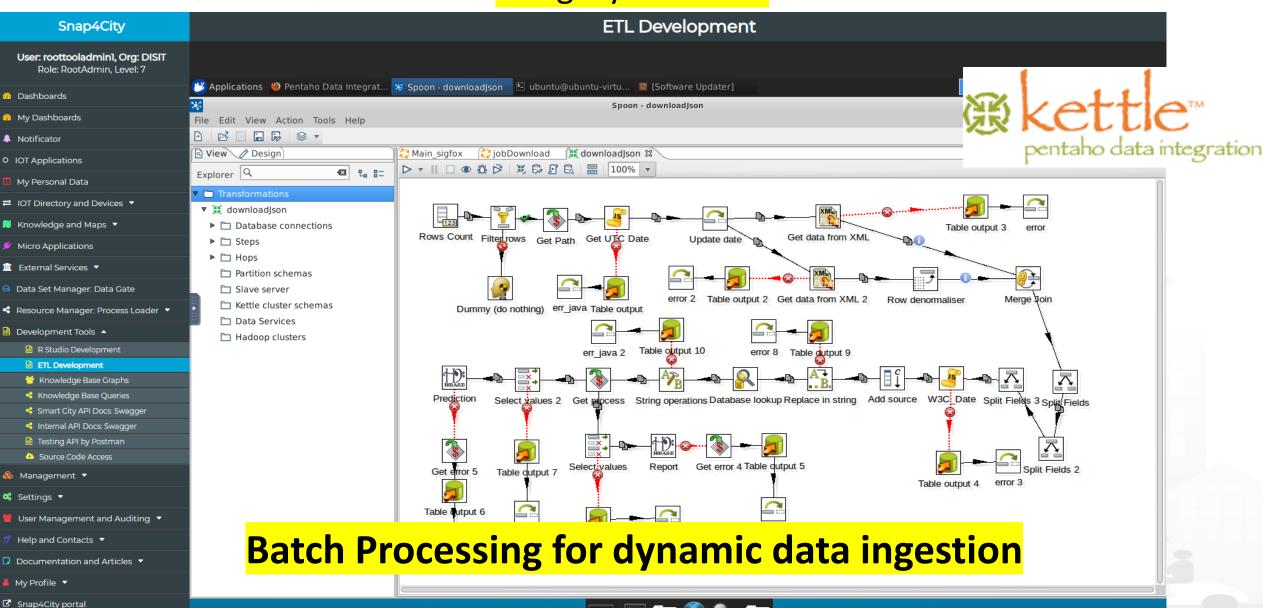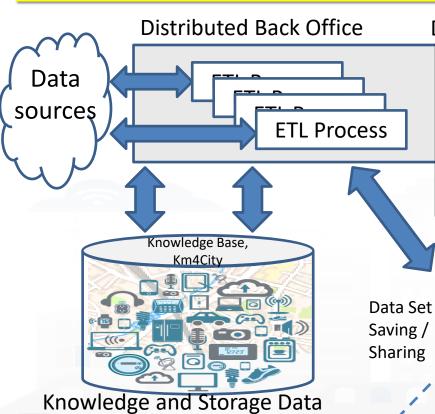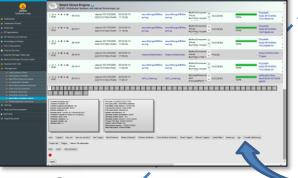
kettle™
pentaho data integration

Distributed Back Office

DISCES scheduler production

ETL Development Environment

Data sources

ETL Process

Data Gate

Knowledge Base, Km4City

Knowledge and Storage Data from the Field and City

Data Set Saving / Sharing

Saving / Sharing reusing
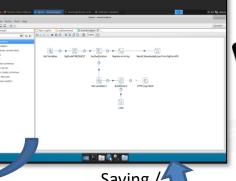
Data Set Loading/ Downloading

Resource Manager

Schedule Execute

Load data or prepare for data ingestion
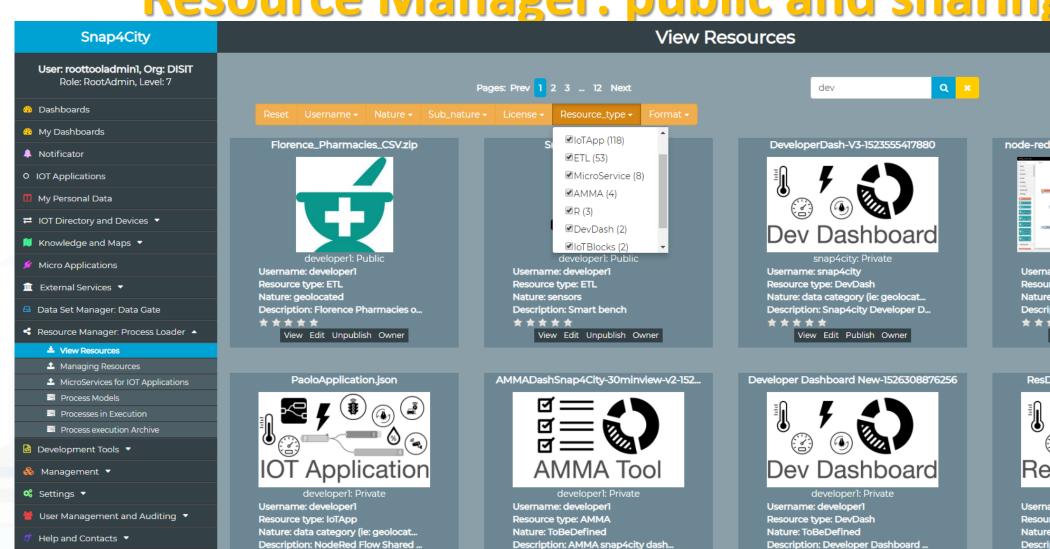
GitHub

Resource Manager: public and sharing

Data Gathering and Knowledge Management

- Data ingestion can be performed by using multiple tools:
  - ETL processes, IOT Applications, Data Gate, WebScraping. We suggest:
    - ETL for static / periodic data in PULL
    - IOT App for real time data and flow, from IOT Brokers/Devices
    - DataGate for Static Data, upload them as files, or collected from other CKAN
    - WebScraper for scraping data from Web Pages, when authorized!
- See how to test cases:
  - **HOW TO: add data sources to the Snap4City Platform**
  - **HOW TO: define privacy rules for personal data, produced by the end-users own device**
  - **US6.   Developing and using processes for data transformation**
  - **TC6.1 - Managing DataSets via DataGate: ingest, search, download, upload, annotate, share**
  - **TC6.3 - Creating ETL processes for automated data ingestion and data transformation**
  - **TC6.5 - Managing Heterogeneous File Ingestion via ETL processes**
  - **TC6.9 - ETL processes for multiprotocol and format data ingestion, see on GITHUB for library**
  - **TC9.2 - Managing heterogeneous File Ingestion, protocols, formats via IOT applications, and open standards**
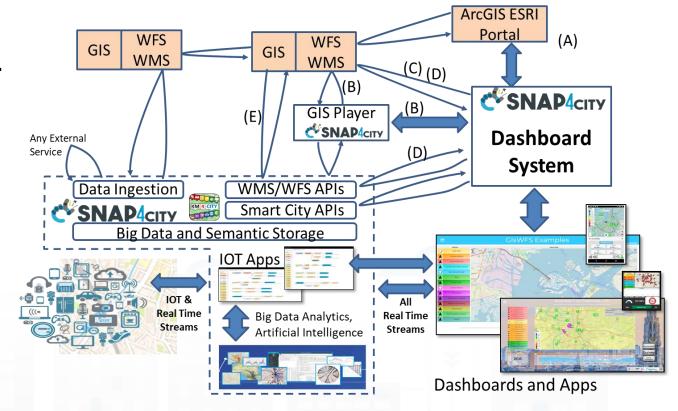
- **Snap4City is interoperable with**
  - ESRI ArcGIS Enterprise, Portal, Pro/MAP, …
  - other GIS tools supporting WFS, WMS, GeoJSON, GML
- **Snap4City is interoperable since:**
  - **Provides** info/data in WFS, WMS
  - **Exploits** data/info from WFS, WMS
  - **Import** data/info from WFS/WMS

- The Snap4City platform can be installed on premise using **Snap4City Appliance**
  https://www.snap4city.org/471
  - **StartSNAP4CITYVM** includes the Dashboard Builder that is capable to work with WFS WMS protocols for the integration with GIS platforms as ESRI ArcGIS, QGIS, directly or using **Snap4City GIS player**.
  - **KBSSMVM** includes the Smart City API and WFS API which can be used to data harvest from any GIS servers and GIS desktop tool
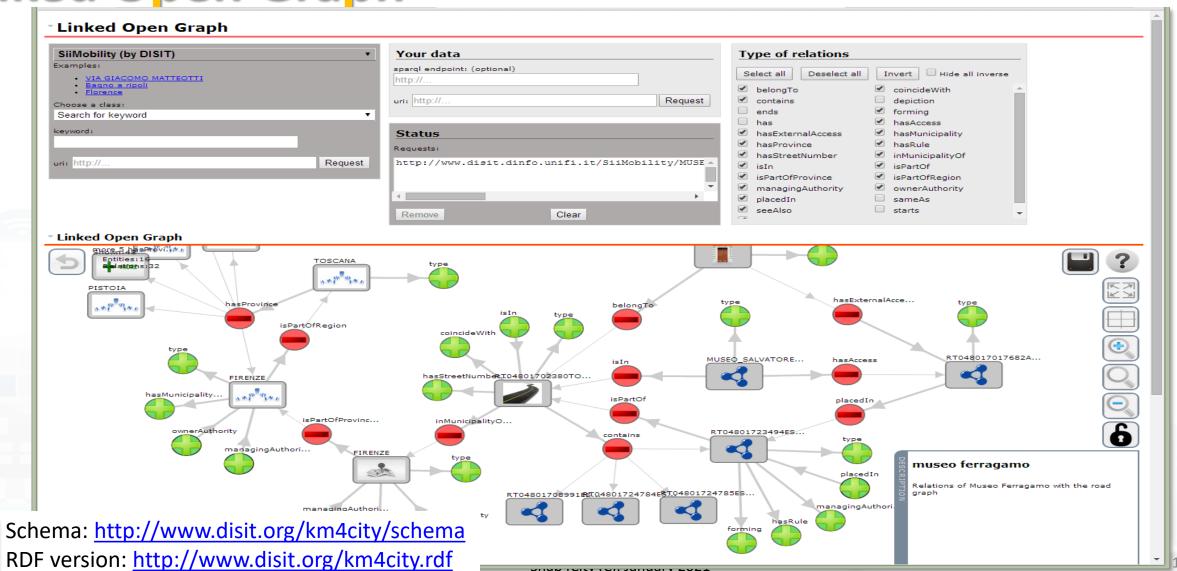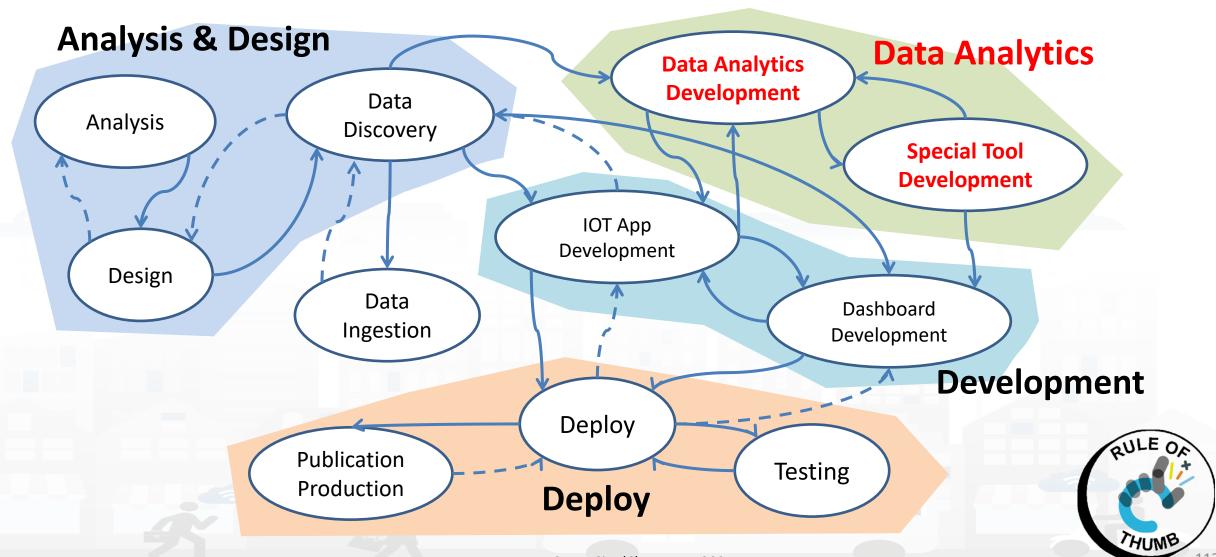
Linked Open Data

Linked Open Graph
LOG: https://log.disit.org

Schema: http://www.disit.org/km4city/schema
RDF version: http://www.disit.org/km4city.rdf

Development Life Cycle Smart City Services

Analysis & Design

Data Analytics

Analysis

Data Discovery

Data Analytics Development

Special Tool Development

Design

Data Ingestion

IOT App Development

Dashboard Development

Development

Deploy

Publication Production

Testing

Deploy
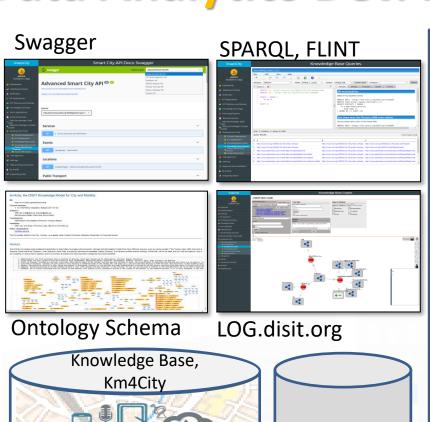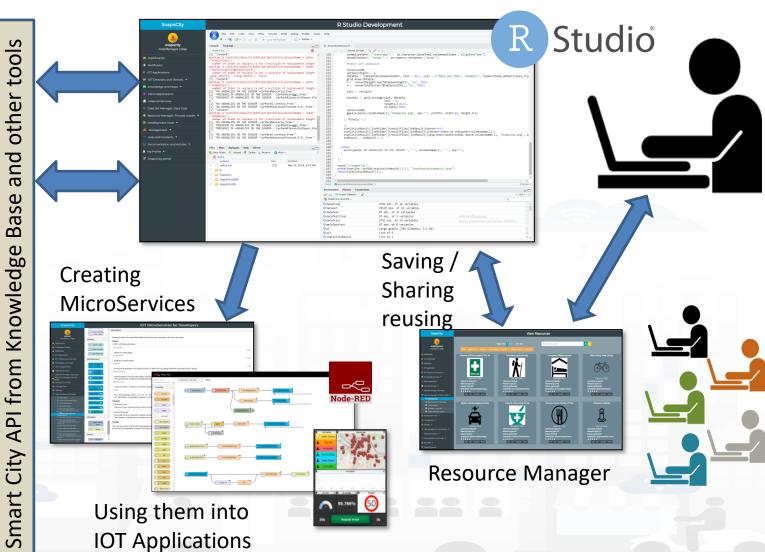
Data Analytics Dev. in R Studio and/or Tensor Flow

Swagger

SPARQL, FLINT

Ontology Schema

LOG.disit.org

Knowledge Base, Km4City

Big Data Store Facility

Smart City API from Knowledge Base and other tools

Creating MicroServices

Using them into IOT Applications

Saving / Sharing reusing

Resource Manager

Data Analytics Development in Python, ..
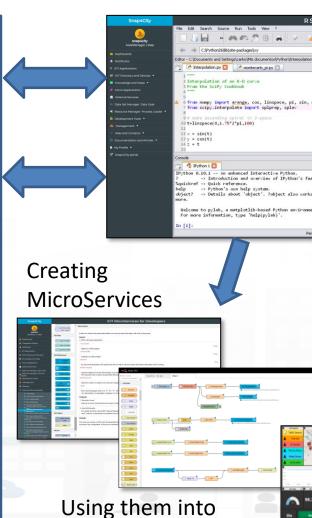
Swagger

SPARQL, FLINT

Coding Testing

Ontology Schema

LOG.disit.org

Smart City API from Knowledge Base and other tools

Creating MicroServices

Saving / Sharing resusing

Knowledge Base, Km4City

Big Data Store Facility

Using them into IOT Applications

Resource Manager

Data Analytics Development in Java

Swagger

SPARQL, FLINT

Coding Testing

Ontology Schema

LOG.disit.org

Smart City API from Knowledge Base and other tools

DISCES scheduler

Saving / Sharing resusing

Knowledge Base, Km4City

Big Data Store Facility

Monitoring

Process
Process
Process
Process

Data sources

Distributed Back Office
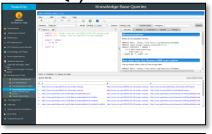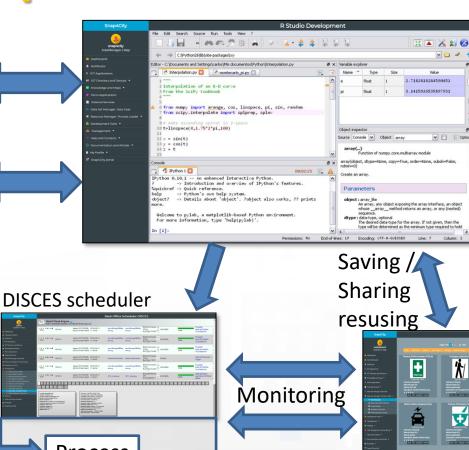
Resource Manager
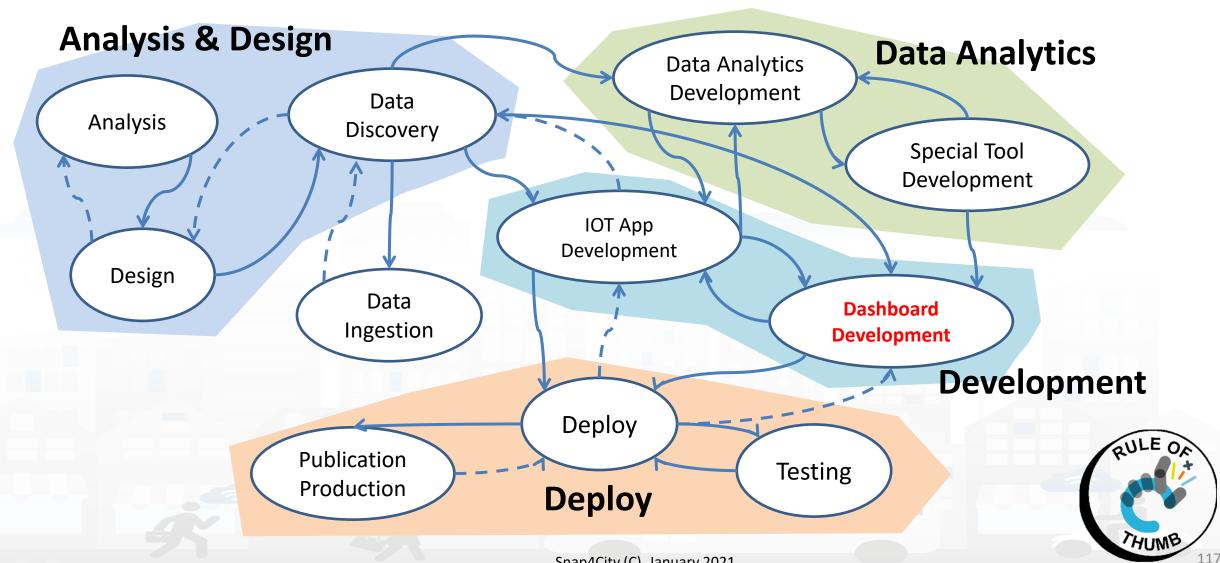
Loading new Node-RED nodes/microservices from external Palet

- Ask to RootAdministrator to have your custom Node-RED nodes/modules added to your IOT Applications
  - https://www.snap4city.org/drupal/contact
- A validation of requested Node-RED nodes will be performed to avoid violation of security and privacy for all
- Administrators may load custom Node-RED nodes/modules
- This limitation is not present in your on premise installations of Snap4City

Development Life Cycle Smart City Services

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Deploy

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Dashboard List and Editor

Dashboard List and Editor

Wizard

Dashboard features	Data and widgets	Check and summary

Map

Single data widgets

Multi data widgets

Data sources

	High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Last Date		Last Check	Ownership
All selected (10) ▾		All selected (55) ▾	All selected (776) ▾	All selected (315) ▾		All selected (47) ▾				All selected (2) ▾
	Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather	Vaglio		2018-07-08 16:00:18	public
	Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather	Vergemoli		2018-07-08 16:00:18	public
	Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather	chiano		2018-07-08 16:00:18	public
	Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather	aiano		2018-07-08 16:00:18	public
	Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather	Vaglia		2018-07-08 16:00:18	public
	Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather	Vagli sotto		2018-07-08 16:00:18	public
	Special Widget	**Environment**	**Weather Forecast**		**Previ_Meteo**	**special weather**	**Vagli di sotto**		**2018-07-08 16:00:18**	**public**
	Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather	Uzzano		2018-07-08 16:00:18	public

Hide columns ⚙▴ Res... Selected rows: 0   Previous 1 2 3 4 5 ... 1081 Next   Search

Choosen data sources

High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Last Date	Last Value	Healthiness	Last Check	Ownership	Remove

Previous Next   Search

- Select the area of your interest: panning and zooming
- Select the
  - graphic aspect of your interest, or
  - High Level Type of your interest, or
  - Make a search if you a have a precise idea or
  - Act on filters: nature, subnature, type, name, value, date, health, owner, …
  - Combine them as you like
- Select the lines of your interest
- Then click on Next and get the Dashboard by wizard

Close

Dashboard Wizard

The Wizard help you in selecting only possible combination of data vs graphic representation

Dashboard Development

IOT Applications

Knowledge Base, Km4City

Knowledge and Storage Data from the Field and City + MyKPI ++

Widget Collection

Micro Applications

External Services

Custom Widgets/ Synoptics

Dashboard Wizard

Dashboard Editor

Public Dashboard Collection

Create, save, load, delegate, grant access

My Own Dash/App

Developing new Dashboard Graphic Widget

- The development of new Widget is feasible for programmers
  - in PHP, JavaScript and CSS
    - The starting point is the Core Snap4City Virtual Machine Appliance StartSNAP4CITYVM: https://www.snap4city.org/471
    - While the source code is also accessible on GitHub/DISIT
    - see TC3.11 - New graphics widget can be easily created, Dashboard Widget Creation
  - creating a new Graphic widget via SVG and programming: Custom Synoptics and Widgets for Dashboards https://www.snap4city.org/504
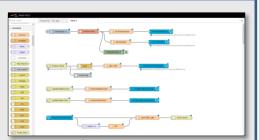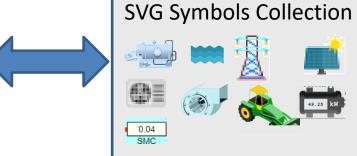
Custom Widget / Synoptic Development

SVG Symbols Collection

Inkscape editor on your computer

Create, save a Custom Widget in SVG

IOT Applications

Knowledge Base, Km4City

Knowledge and Storage Data from the Field and City
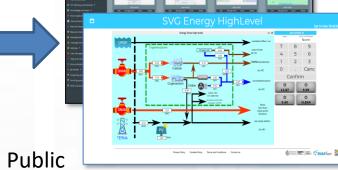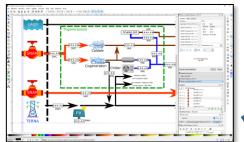
Public Dashboard Collection

My Own Dash/App

SVG Energy HighLevel

Dashboard Editor

Create, save, load, delegate, grant access

1. Create and Load a Custom SVG
2. Select/Reuse an SVG
3. Make and Instance of Synoptic by Associate Variables with MyKPI
4. Create on Dashboard a Widget based on Synoptic HLT such as Ext. Srv.:
   - https://www.snap4city.org/synoptic/v2/synoptic.html?id=xxxx

Special Custom Widgets

- Smart parking
- Smart Energy
- Smart Light
- Smart ….
- Energy View
- Custom Controls
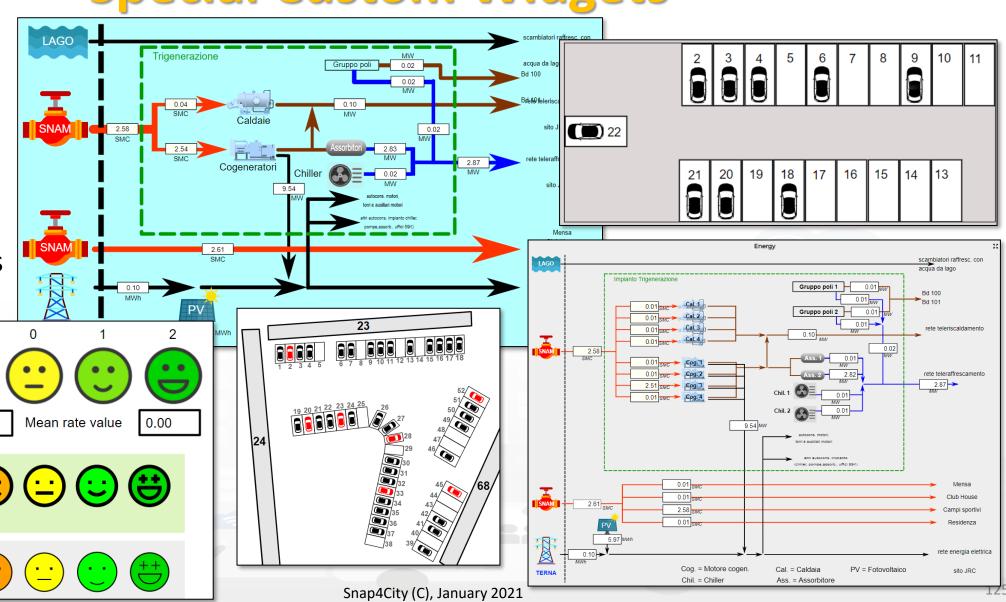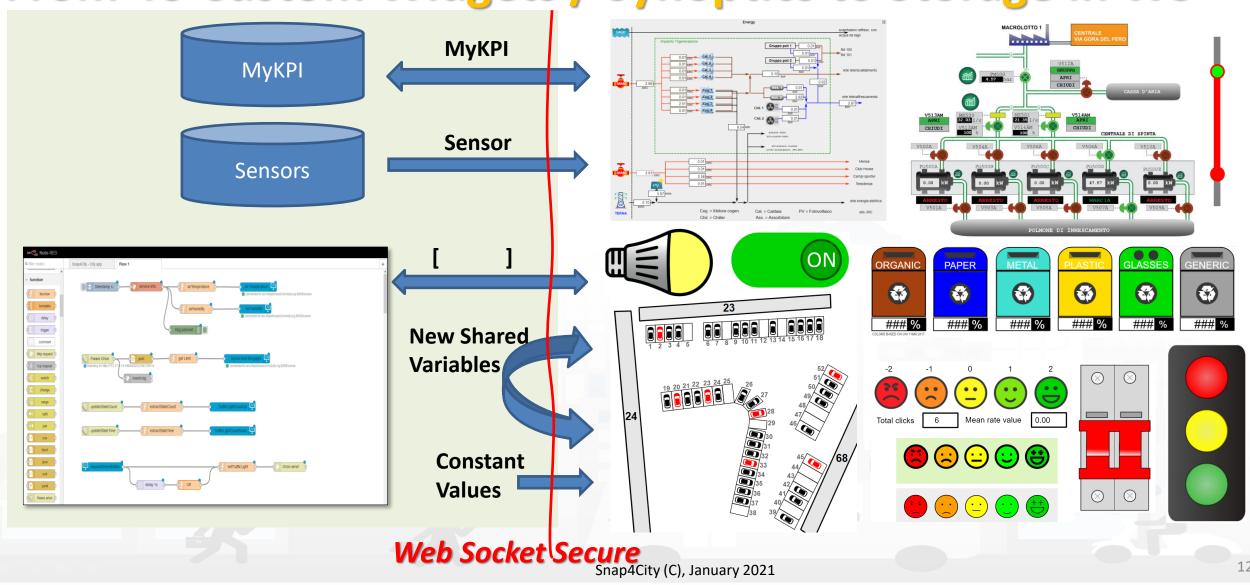
From-To Custom Widgets / Synoptics to Storage in WS

MyKPI

Sensor

[   ]

New Shared Variables

Constant Values

Web Socket Secure

Dashboards

- **Suitable** as: City Dashboard, App interface, and Control Room Dashboards, Situation Room Dashboard, Operator Dashboard

- **Created** visually compounding graphic Widgets
  - Each widget has an autonomous update
  - Each metric/data-source may have associated with an alarm: blinking and sending events to people and machines in different manners

- **Can be**: public or private, private dash can be delegated or passed in ownership

- See https://main.snap4city.org/management/dashboards.php?linkId=dashboardsLink&fromSubmenu=false&sorts[title_header]=1

- See the following tutorials
  - **HOW TO: create a Dashboard** in Snap4City
  - **US1.   Using City Dashboards**
  - **US2.   Using and Creating Snap4City Applications with Dashboards**
  - **US4.   Creating City Dashboards and related Event Monitoring and Actions**
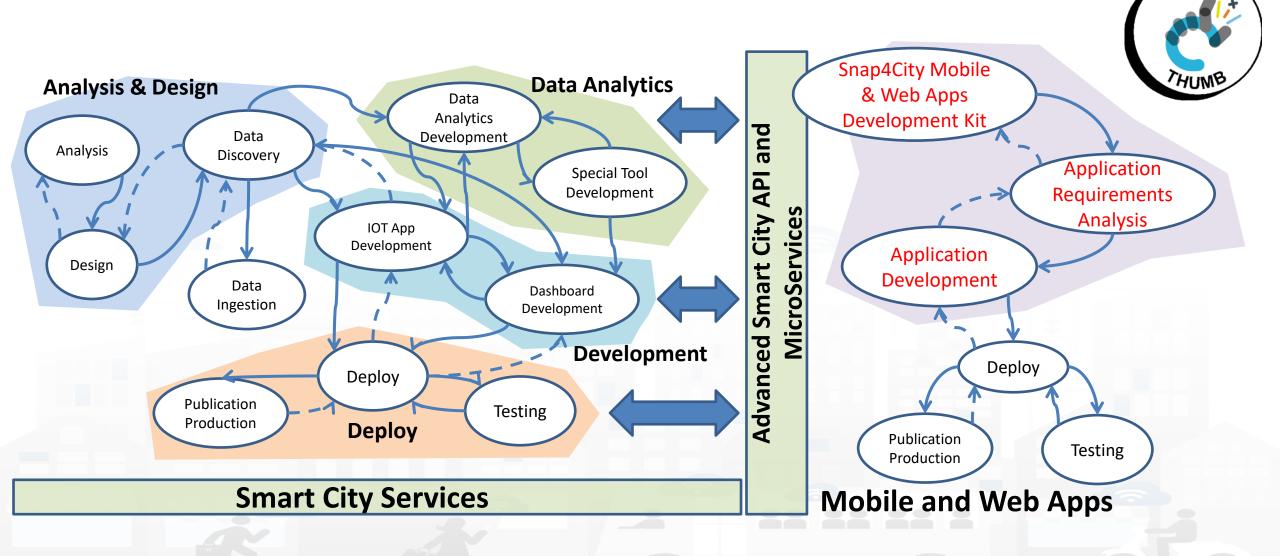
Level 1 Users: using dashboards

- [TC1.3.   Accessing and using Dashboards with any device](#)
- [TC1.4.   Dashboards Showing Data Real Time and Historical/trends, comparison](#)
- [TC1.5.   Dashboards showing a range of different High Level Types: KPI, POI, IOT dev, MicroApp, Maps using different kind of Graphics Widget. Monitor city status with Dashboards](#)
- [TC1.6.   Dashboards using different kind of graphics Widgets matching with High Level Types, Monitor city status with Dashboards](#)
- [TC1.12.   Dashboard with MicroApplications](#)
- [TC4.1.   Dashboard and Notificator](#)
- [TC4.6.   Dashboard with city events, ESB, police, traffic, etc.](#)

User: paolonesi, Org: none
Role: Manager, Level: 0

- Dashboards
- My Dashboards
- Notificator
- IOT Applications
- My IOT Devices
- Knowledge and Maps
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager
- Help and Contacts
- Documentation and Articles
- My Profile

Develop Mobile & Web Applications Exploiting Snap4City Smart City Services

Developing Web and Mobile Apps, MicroApps,..

Mobile Apps

Web App HTML5, MicroApplications

Embed into Web pages

City User

Advanced Smart City API

Knowledge Base, Km4City

Snap/Km4City Open Source development tool kit
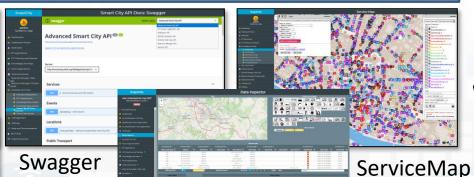
Mobile Application Monitoring Administrator

Benefits of CORDOVA on Cross Platform Mobile App Development

Swagger

DataInspector

ServiceMap

Developer
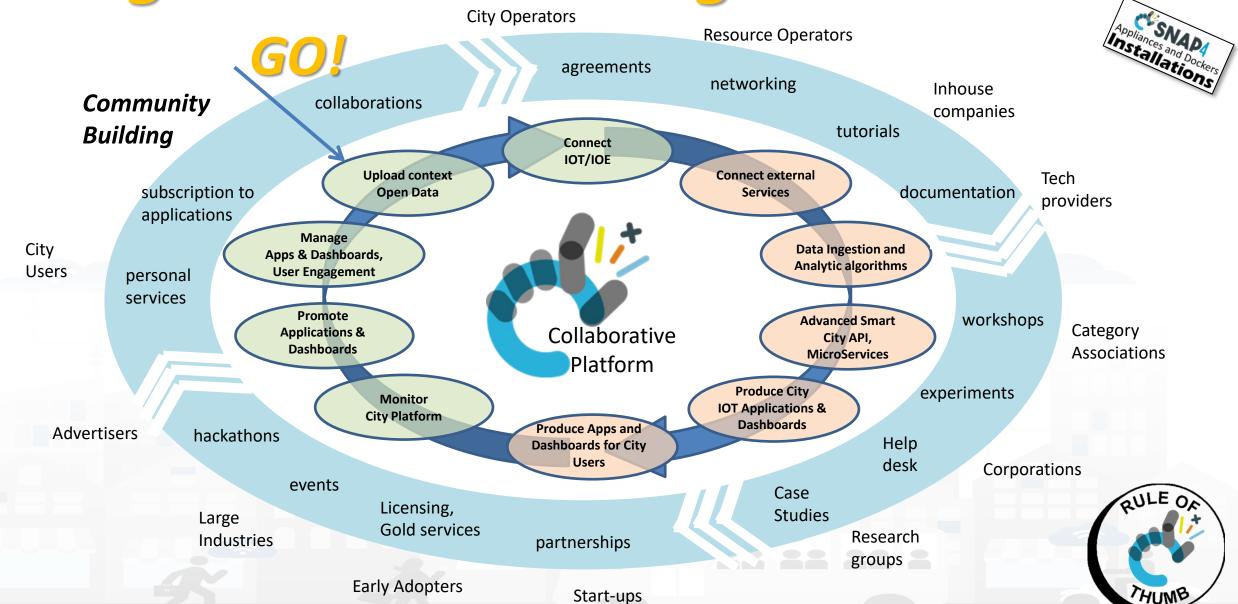
How to Add Functions that are not present in the Platform

Living Lab Accelerating

GO!

Community Building

Collaborative Platform

- Connect IOT/IOE
- Connect external Services
- Data Ingestion and Analytic algorithms
- Advanced Smart City API, MicroServices
- Produce City IOT Applications & Dashboards
- Produce Apps and Dashboards for City Users
- Monitor City Platform
- Promote Applications & Dashboards
- Manage Apps & Dashboards, User Engagement
- Upload context Open Data

City Operators
Resource Operators
agreements
networking
Inhouse companies
collaborations
tutorials
subscription to applications
documentation
Tech providers
City Users
personal services
workshops
Category Associations
experiments
Advertisers
hackathons
Help desk
Corporations
events
Case Studies
Large Industries
Licensing, Gold services
partnerships
Research groups
Early Adopters
Start-ups

SNAP4CITY
KM4CITY
SNAP4 Appliances and Dockers Installations
RULE OF THUMB

Development Life Cycle Smart City Services

Analysis & Design

Data Analytics

Development

Deploy

Analysis

Data Discovery

Data Analytics Development

Special Tool Development

Design

Data Ingestion

IOT App Development

Dashboard Development

Deploy

Publication Production

Testing

Adding a Function that is not present on the platform

- Snap4City allows at the AreaManagers to Develop new functions for:

  - Interacting with the field: IOT Sensors/Actuators, IOT Devices

  - Data production by using: IOT Devices, IOT Brokers, ..

  - Data Ingestion/Transformation by using: ETL, IOT Applications, WebScraper, DataGate

  - Data Analytics by using: R Studio, Java, C++, Python

  - Data Rendering on Dashboards: PHP, HTML5/JavaScript, Web App, etc.

  - User interaction and App: Mobile App, MicroServices, Dashboards

Snap4City/Industry: Smart Solution IOT as a Service

Smart Solution IOT as a Service

- Snap4xxxx applications may exploit multiple paradigms as data driven, stream and batch processing, putting co-creation tools in the hands of:

  - **Smart Living Lab** users and developers a plethora of solutions to develop applications without vendor lock-in nor technology lock-in,

  - **final users** customizable / flexible mobile Apps and tools,

  - **city operators** and decision makers specialized / sophisticated city dashboards and IOT/IOE applications for city status monitoring, control and decision support.Open to Organizations

- Training and manuals: https://www.snap4city.org/108

- Help Desk: https://www.snap4city.org/3

- SLA: https://www.snap4city.org/497

- Terms of Use: https://www.snap4city.org/drupal/legal

Specialized Offer

Snap4xxxx as Smart Solution IOT as a Service for

- **Who would like to create** Living Labs as community exchanging experience with other cities as well;

- **Research Institutions, Departments** and **Projects** which would like to perform research and experiments in the area of Smart City and IOT, without the needs of setting up the infrastructure, exploiting open data, collaborating, accessing to Data Analysis on demands, etc. This is the spirit of **EOSC**, European Open Science Cloud Marketplace at which Snap4City is registered as DISIT Lab, see [**EOSC**].

- **Public Administrations**, as small cities that would like to offer smart services and does not have economic power to manage service on their premise from them self.
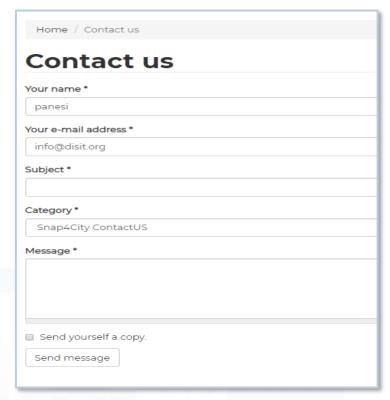
Help Desk and SLA

- **https://www.snap4city.org/drupal/contact**
- Bug Reporting
  - **https://docs.google.com/forms/d/e/1FAIpQLSfD QtKqgLIIyycNXiazeYEh1SsRG1YL8Ze4ThD8nZoA5 jsoXw/viewform**
- For Service Level Agreement see:
  - **Service Level Agreement**
- Help Desk and Contact:
  - **https://www.snap4city.org/3**
- Availability rates:
  - **https://www.snap4city.org/388**

Home / Contact us

Contact us

Your name *

panesi

Your e-mail address *

info@disit.org

Subject *

Category *

Snap4City ContactUS

Message *

☐ Send yourself a copy.

Send message

Periodo di riferimento: 09 / 2019

Disponibilita' media: 99.91%

MTTR: 00G 00:10.00

MTBF: 04G 14:04.24

down tot.   4

max(t_down):   00G 00:10.01

Providing consulting, customization, training, and developments

- Snap4City solution can be installed on premise and one cloud, private and public.

- **Snap4City (DISIT Lab and/or Snap4 SRL (INC.), or other companies as well), provide support, if needed, for design and/or Develop, set up:**
  - **Training and tutoring;**
  - **Snap4xxxx infrastructures and architectures**;
  - **data analytics,** that could be developed as proprietary solutions for the customer or as open source;
  - **data ingestion processes**, to enable them to have data into the platform;
  - **adaptor for some specific protocol or legacy/third part Tool**, that we prefer to release as open source, but if the connection is with some proprietary tool, the buyer could be interested to keep these solutions as private;
  - **IOT devices, full solutions, dashboards, specific dashboard widgets, etc.**

SNAP4CITY LIVING LAB FOR COLLABORATIVE WORK
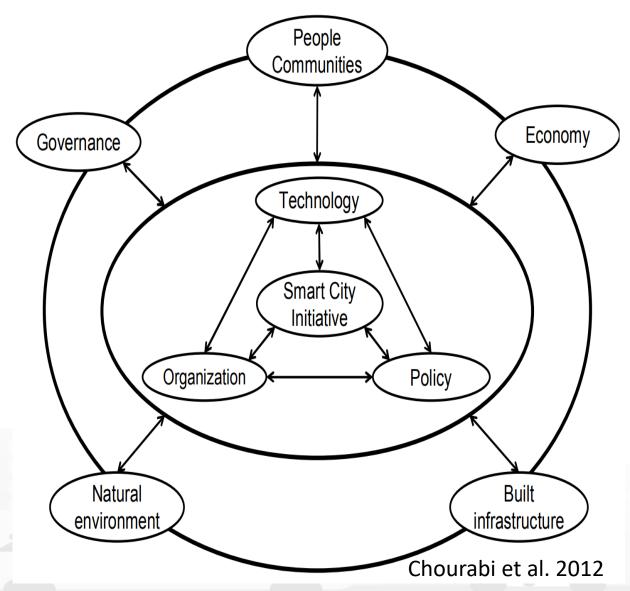
Smart City Process

- Many aspects should be taken into account for a successful Smart City transformation

- → *The influence of each of them depends on context, attitude of the institutions, internal structure, etc.*
  - *Parallel actions can conflict, compete …*
  - *Spreading of efforts may distance the goals*
  - *……*

- → *The process may become sustainable, harmonized and faster with a Living Lab Strategy and Support*

Chourabi et al. 2012

The Living Lab Concepts and Organization

Snap4City tools and Living lab Solution have been Created to satisfy requirements of international organizations as:

- **ENOLL**: https://www.openlivinglabs.eu/
  - European Network **of Living Labs**

- **EIP-SCC**: European Innovation Partnership on Smart Cities and Communities
  - https://eu-smartcities.eu/

- **Select4Cities**: Pre-Commercial Procurement Project to develop a data-driven, Internet-of-Everything (IoE) platform for large-scale urban co-creation
  - https://www.select4cities.eu/

1° place award to

for **SNAP4CITY**

https://www.snap4city.org/558

Requirements and Objectives

- Serve as a **City Dashboard**, **App User Interface**, etc.
  - Real time and historical data, any device, sensors and actuators
  - Sensors, KPI, maps, data trends, real time data, charts, etc.
- Referral / **historical data, and Open Data**:
  - shadow, access (API, storage, any protocol), production of OD, export
- **Data Driven Real Time communication &** processing:
  - IOT Applications, IOT edge, multiple operating systems, embedded systems, **MicroServices**
  - in/out data driven from/to the field into: applications, notifications, etc.
- **Data Analytics**: Machine Learning, statistics, reasoning, …
- **Serve as Living Lab**: open innovation, coworking; collaborative work; sharing: data, processes, dashboard, experiences, solutions, ….
- Experimented on **large scale cases**

Non functional requirements

- **Open Source** and based on Open Source Tools and OS
- Open **Standard** for communication and API for In/Out
- **Scalable, Robust, Distributed** and Decoupled, modular, Service Oriented, open to external services and data sets
- **Data driven**, for reading and data analytic
- **Heterogeneous**: any device, private and public, custom and..
- **Interoperability**: protocols, internal API, Smart City API, capable to integrate with legacy conditions in place, modular, reusable,...
- Communication with things: any protocol, any format, ...
- **Security** by Design: HTTPS, TLS, ...
- **User Centric** Design: privacy by Design (and **GDPR**), personalized, personal data management, ...

Security/Privacy Requirements

- **Managing** private data together with public data
- **Private data management** according to GDPR
  - Browsing, downloading, controlling rights, delegating access, revoking accesses, etc.
  - Keep them safe
- Secure enough to delegate management of data regarding public security:
  - Data that could be used against us by some terrorist, or anyway by someone with some bad intention, for example to access in our home when we are far away, etc.

Aspects of the Living Labs

- **Living lab capabilities and supports**
  - Organizations are supported in the user management and persecuting their goals
  - Projects can be launched and targeted with groups, hackathons, tools, etc.
  - Individual (user interaction), are supported by tools and training material

- **Instruments of the Living Lab**
  - **Real-life context**: data and solutions to be taken as examples, from devices to IOT Applications, and Dashboards. A large set of **real scenarios described**
  - **Multi-stakeholder:** mainly apply to organizational, a community from where anybody can take advantage
  - **Multimethod**: the same results can be obtained by using multiple methods
  - **Active user co-creation**: the platform cansupports: collaborative work, supervising by the teachers, sharing and delegation.
  - **Secure**: it is GDPR compliant and passed PENTest and Vulnerability Test

Living Lab Flexibility

Snap4City Satisfies all Requirements of ENOLL Select4Cities and EIP-SCC
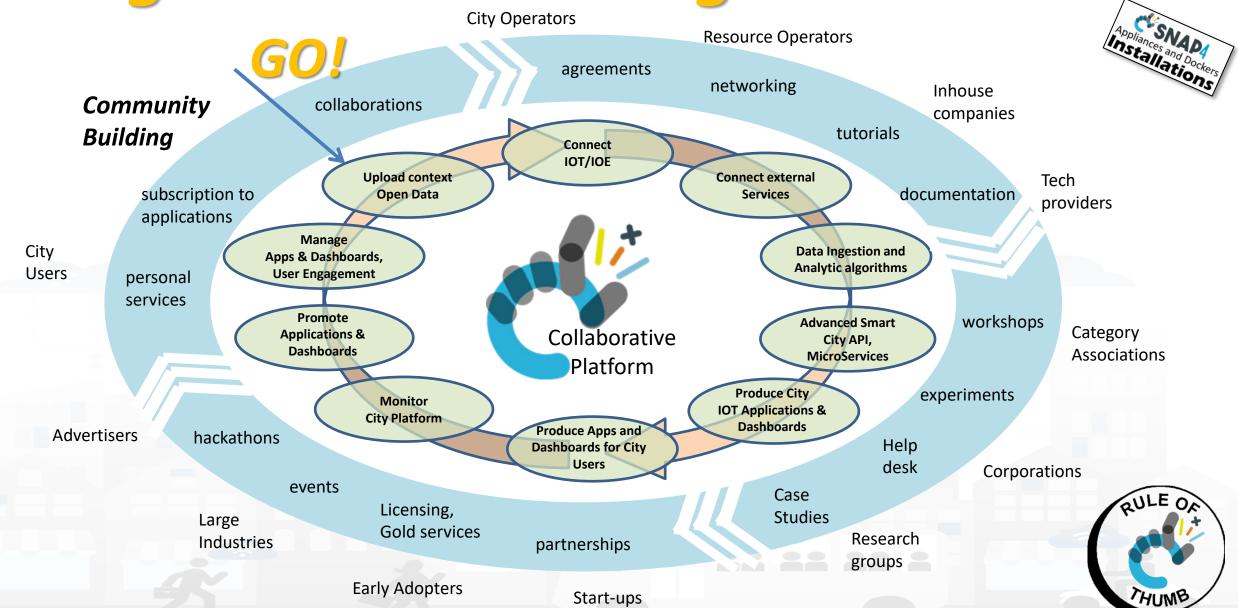
- **Multiple modalities to perform the same activities**

- **Tuned for Beginners and Skilled people**

- **Visual interface and programming tools**

- **Resources and artefacts sharing for learn acceleration and co-working**

- **Open Living and co-working Portal**: https://www.Snap4City.org

Living Lab Accelerating

GO!
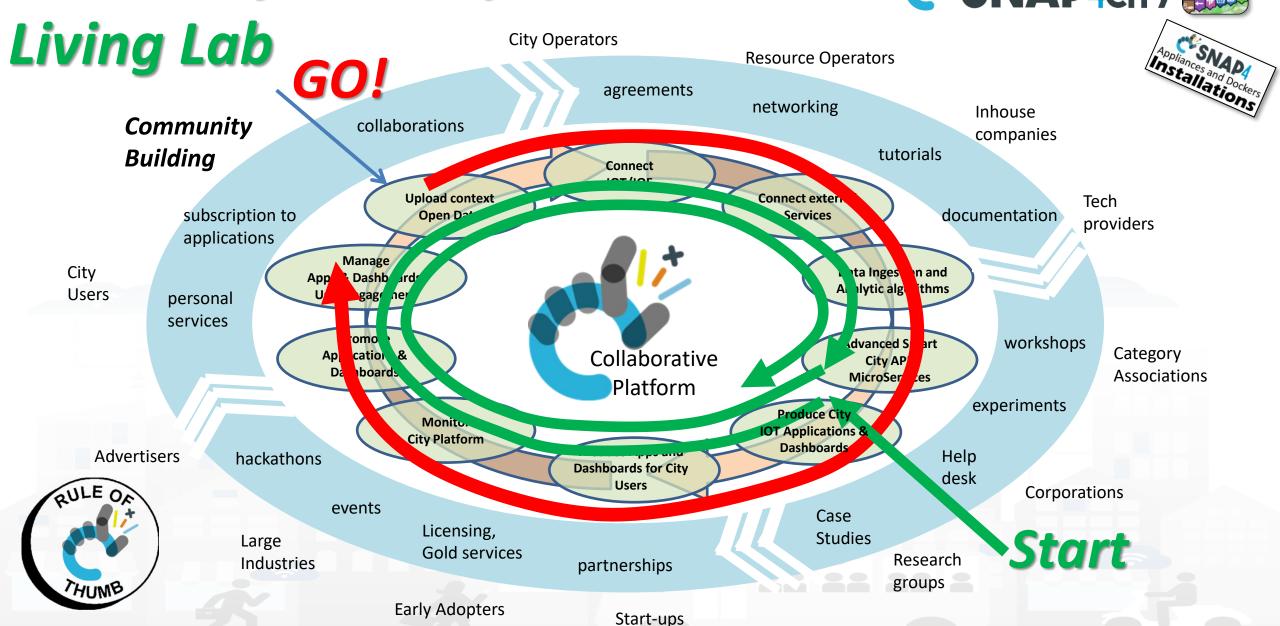
Community Building

Smart City Start Up vs Living Lab

Community Building

GO!

City Operators
Resource Operators
agreements
networking
Inhouse companies
tutorials
collaborations
Connect IOT/IOE
Connect external Services
documentation
Tech providers
subscription to applications
Manage Apps & Dashboards User Engagement
Data Ingestion and Analytic algorithms
City Users
personal services
Collaborative Platform
Promote Applications & Dashboards
Advanced Smart City API MicroServices
workshops
Category Associations
Monitor City Platform
Produce City IOT Applications & Dashboards
experiments
hackathons
Develop Apps and Dashboards for City Users
Help desk
Advertisers
events
Corporations
Large Industries
Licensing, Gold services
partnerships
Case Studies
Research groups
Start
Early Adopters
Start-ups

RULE OF THUMB

Engagement

- **Finding the right participants to the Living Lab**
  - Campaigns tailored to the right audience according to the role: testing, developers, requirements collections, etc.
    - Finding specific profiles via stakeholders
    - And/OR: Web based recruitments, App Based, etc.
  - Motivation to participate, eventual incentives

- **Inform/educate the Participants about the project:**
  - after and before testing/validations, etc.

- **Protect the Participants privacy**, ask to NDA and provide the NDA, GDPR compliant

- **Support**: during the project, SPOC, Help-Desk, web portal, logistic

The Living Lab Snap4City Tools

Snap4City/Industry Community

- Most of Organizations on Snap4City.org also correspond to companies or institutions that have an installation of Snap4City tools on their Premise,
  - such as: Pisa, SmartGarda Lake, Snap4, ALTAIR, etc.
- This double way allows them to:
  - test the news,
  - share experiences with other groups,
  - get visibility,
  - work in the collaborative environment, and
  - be better supported by Snap4City.org and DISIT Lab personnel.
- Each instance of Snap4xxxx solution *can decide to join the federation* of SmartCity API to exploit shared data.
  - This allows to exploit regional data for city installations applications (web, mobile, dashboards, etc.) without reloading them for example.

Main Organizations/areas
- Antwerp area (Be)
- Capelon (Sweden: Västerås, Eskilstuna, Karlstad)
- DISIT demo (multiple)
- Dubrovnik, Croatia
- Firenze area (I)
- Garda Lake area (I)
- Helsinki area (Fin)
- Livorno area (I)
- Lonato del Garda (I)
- Modena (I)
- Mostar, Bosnia-Herzegovina
- Pisa area (I)
- Pont du Gard, Occitanie (Fr)
- Roma (I)
- Santiago de Compostela (S)
- Sardegna Region (I)
- SmartBed (multiple)
- Toscana Region (I), SM
- Valencia (S)
- Venezia area (I)
- WestGreece area (Gr)

Snap4City (C), October 2020

Who is using the Living Lab of Snap4City today

- **Snap4City.org**: multiple Organizations
  - **DISIT**: Univ. Milano, Univ. Firenze, Univ. Cagliari, etc.
  - **Firenze**: City Firenze, and inhouse companies
  - Multiple Organizations for **HeritData pilots**:
    - Firenze, Valencia, Dubrovnik, Mostar, WestGreece, Pont Du Gard
  - **CAPELON**: Capelon Sweden
  - **…Antwerp, Helsinki, …**
- **Snap4Pisa** on MOBIMART: AEDIT, Pisa, PISAMO, ….
- **SmartGardaLake:** SmartEA, Univ. Brescia

Snap4City: Living Lab supporting tools

- **All 100% Open Source**
- **Snap4City web portal**
  - **Scenarios** with ready to use solutions
  - **Organization/Groups** and co-working support
  - Developing tools and Documentation, training, tutorials, HOW TO…
  - Self Assessment tools to monitor your progresses to get suggestion
  - Assistants: to get training and problem solving
  - **Developing tools**
    - All of them are Web-Based developing tools (except for the Mobile App on Android and iOS)
  - **Resource Manager for Sharing:**
    - experiences, data warehouse tools, IOT Applications, Data Analytics, etc.
- **Hackathons**:
  - IOT Apps, Dashboards, Mobile Applications, Data Analytics, etc.

Snap4City

Your Level

User: adifino, Org: DISIT
Role: Manager, Level: 4

Home   Partners and Interoperability   Tools ▾   Tutorials and Videos ▾   Blog ▾   Contributions ▾

- Dashboards (Public)
- Dashboards of My Organization
- My Dashboards in My Organization
- IOT Applications
- My IOT Devices
- Knowledge and Maps ▾
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager
- Help and Contacts ▾
- Documentation and Articles ▾
- My Profile ▾
- Snap4City portal
- Km4City portal
- DISIT Lab portal

All Tools

Home / Tutorials and Videos / Welcome: how to start using Snap4City for beginners

Username: adifino

Welcome: how to start using Snap4City for beginners

Personalized Suggestions

Snap4City developers suggest you reading:

You have already created a **Dashboard**. Now, you may decide to make it public (visible and accessible) to all on WEB, or to provide access in view to other specific users that you know by nickname. In addition, you can pass the Ownership of a **Dashboard** to some other user of the system, and you can clone the **Dashboard** as well. So that you can create **Dashboard** for other users as well. We suggest to test these functionalities since you can:

- access to Data Set **Manager** to upload/download, share data sets as files in CSV: https://datagate.snap4city.org/ssologin_handler
- upload data for the **knowledge base** and **dashboards** via Data Set **Manager**,
- access and share of resources as: **dashboards, IOT Applications**, blocks, etc.; https://processloader.snap4city.org/processloader/ssoLogin.php?redirect=page.php%3FshowFrame=false
- access to help and contacts, FAQ, documentation and articles
- manage personal data: profile, IOT Sensors, **Annotations**, Personal Data, Dashboards..; https://www.snap4city.org/drupal/myprofiledata
- Auditing Access to My Data according to **GDPR**.

See this Application development guide on the above possibilities:

TC1.10.   Dashboard delegation to access, and passage of ownership, and/or cloning

Exercises

Full Search

Powered by
www.km4city.org

Search

Search

Organization Groups

Your Org

DISIT
- Operativo

Recent comments

- 1 month 6 days ago

Recent content

SLIDES

If you are not registred please apply for a **free registration** from https://www.snap4city.org and then pass to ACCESS AT THE TOOLS and full Snap4City environment.

Snap4City puts in the hands of City Users a flexible environment to quickly create a large range of smart city applications/views exploiting heterogeneous data and services of stakeholders by IOT/IOE and big data technologies. For Snap4City, City Users can be citizens, students, operators, researchers, decision makers, developers, etc. see Users' Roles on Snap4City.

- **Manager:** is a **final user**, has the capability of: accessing and creating Dashboards with a large set of data (high level types as: POI, sensors, KPI, micro applications, external services, etc.), attaching alerts and notifications; registering IOT Devices; creating IOT Applications exploiting MicroServices; loading and sharing data sets; managing personal data and annotations; full access to documentation, help desk, FAQ, coworking; managing personal profile and data according to GDPR; **NOTE:** accessible features are mainly visual and simple to understand and to use, and provide a limited number of parameters on each dialog and for each action. Default values of created elements can be changed editing elements.
- **AreaManager:** is a **Developer/researcher, students, city operator**, with additional capabilities with respect to the Manager to: register IOT Brokers; creating advanced IOT applications; create massive data transformation processes; create data analytics in multiple languages, testing and load them, create microservices; adding external services; sharing results, loading shapes; analyzing performance of the back office; **NOTE:** technical views and details are fully accessible

Flyer   Download Flyer

News

Last Art.

Ti Suggeriamo di realizzare la tua prima Dashboard (Step 1) [new]
roottooladmin1

Benvenuto al nostro Sindaco ed al suo Team [new]
roottooladmin1

We suggest to Antwerp Developers: How to manage my Dashboards

Suggested Activities to be performed to Learn HOW to use Snap4City:

This page would guide you along few steps to show how the solution allows you to incrementally pass from Level 0 to 5, from a Manager to an Area Manager:

- Level 0 user: access at data/services views of the city by using public Dashboards; (Public User)   **(overview on dashboards)**
- Level 1 user: create personal/professional views/dashboards on data; (Manager),   **(see what a Manager can do),**   **(see how Dashboards can be created)**

VIDEOS

MultiOrganization, Groups and Profiles

Organizations may have their distinct :

- menus and functionalities, GeoArea, Data, Dashboard, Groups of users, managers, Knowledge Base, repositories, etc.

Users may:

- Have personal IOT Devices/Models, Data, IOT brokers, Dashboards, IOT App,..
- Have access to multiple Groups of Multiple Org.
- Delegate them in usage or access
- Change ownership and Clone to pass a copy
- Assesses their usage and themselves, share

Level 1 Users: creating dashboards

Dashboard List → Dashboard Model Selection → Wizard →

See how Dashboards can be created using the wizard: dashboards with selectors, time trends, maps, etc.

- TC1.8.   Visual production of Dashboard via Wizard
- TC1.9.   Search on Wizard for any kind of data managed into the platform, from POI to sensors, KPI, social, etc.
- TC1.10.   Dashboard delegation to access, and passage of ownership, and/or cloning
- TC1.11.   IOT Discovery, on Dashboard Wizard
- TC1.13.   Dashboard Builder External Services and Widgets

Snap4City

User: paolonesi, Org: none

Role: Manager, Level: 0

- 🎨 Dashboards
- 🎨 My Dashboards
- 🔔 Notificator
- �O IOT Applications
- ⇄ My IOT Devices
- 📕 Knowledge and Maps ▾
- 🚀 Micro Applications
- 🏛 External Services
- 🖨 Data Set Manager: Data Gate
- ◄ Resource Manager
- 🚀 Help and Contacts ▾
- 🗐 Documentation and Articles ▾
- 🙍 My Profile ▾
- 🔗 Snap4City portal
- 🔗 Km4City portal
- 🔗 DISIT Lab portal

www.snap4city.org

Home   Partners and Interoperability   Tools ▾   Tutorials and Videos ▾   Blog ▾   All organization with related group

Home / TC1.8 - Visual production of Dashboard via Wizard

TC1.8 - Visual production of Dashboard via Wizard

Test Case Title	TC1.8 - Visual production of Dashboard via Wizard
Goal	As a any user I can • Create a Dashboard, composing it on the basis of data vs widgets, with large collection of data kind and corresponding graphics widgets, including: map, table, graphs, timetrend, weather, and many special widgets. • Modify an available Dashboard, editing general information and widgets, via Dashboard Builder
Prerequisites	The user is registered and logged in the system Using a PC or Mobile with a web browser. Access to the Dashboard Builder.
Expected successful result	See changes performed on the modified dashboard. Your user account into the Dashboard Builder has been endowed of a number of dashboard for using them, changing them without problem for the system. See the created dashboard and play with them.
Steps	

Example 1: Creating a City Dashboard

The creation of a dashboards has been strongly simplified with the im
matching data vs graphics representation, thus arriving at creating au

You can start testing this requirement by following the sequence of ac

1. Enter in the main application https://main.snap4city.org and log
   - Main --> dashboards
2. On the left column main menu click on Dashboards item. The preview of the dashboards available for the user will be shown.
3. The Dashboards page shows the preview of dashboards created by the user (identified as "My own"), public dashboards accessible only in view, private dashboards that the user can once he has been delegated by the original dashboard owner, and also eventual dashboard someone that someone has de you.

All Text on the Portal are Hypertext with Links for navigation among major concepts

Username: PaoloNesi

Powered by
www.km4city.org

Search

Recent comments

- 1 week 1 day ago

Recent content

Welcome: how to start using Snap4City for beginners
drupaladmin

Snap4City - scalable Smart aNalytic APplication builder for sentient Cities
new
drupaladmin

For the user: different levels of engagement

- **Manager: Final Users**
  - Level 1: create Dashboards
  - Level 2: create Dashboards that get and produce data, act on city
  - Level 3: add your own IOT Device, create Dashboards with them and city data
  - Level 4: create IOT Applications to make smarter your Dashboards, services, notifications, exploiting MicroServices

- **Area Manager: Developers, Researchers, Operators (Level 5):**
  - Developer of complex services exploiting: R Studio, ETL, External Services, …
  - Creating: MicroApplications, MicroServices, web and mobile application exploiting Advanced Smart City APIs, …
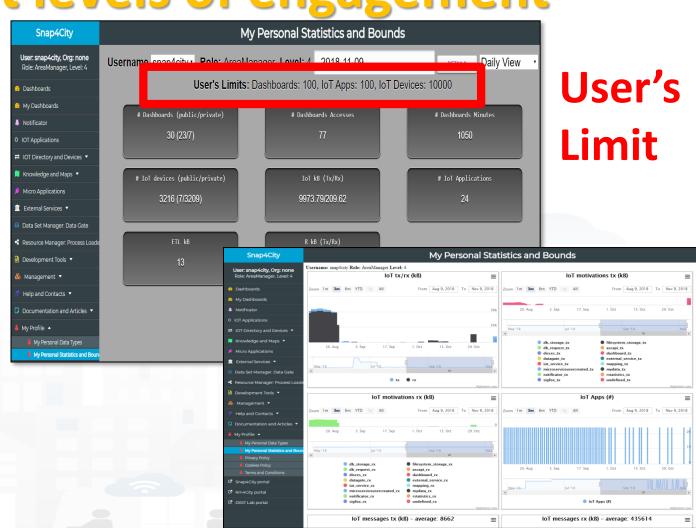
For the user: different levels of engagement

- **Multiple Organizations**

- **Roles:**
  - Managers
  - AreaManagers (developers): special access to computing resources

- **Levels for self-assessment**
  - **Suggestions on next steps to learn on the basis of personal progresses**

User's Limit

Self Assessment

- https://www.snap4city.org/drupal/contact

- Bug Reporting

  – https://docs.google.com/forms/d/e/1FAIpQLSfDQtKqgLlIyycNXiazeYEh1SsRG1YL8Ze4ThD8nZoA5jsoXw/viewform

- For Service Level Agreement see:

  – Service Level Agreement

- Help Desk and Contact:

  – https://www.snap4city.org/3

- Availability rates:

  – https://www.snap4city.org/388

Contact us

Home / Contact us

Your name *

panesi

Your e-mail address *

info@disit.org

Subject *

Category *

Snap4City ContactUS

Message *

☐ Send yourself a copy.

Send message

Periodo di riferimento: 09 / 2019

Disponibilita' media:	99.91%
MTTR:	00G 00:10.00
MTBF:	04G 14:04.24
# down tot.	4
max(t_down):	00G 00:10.01

Resource Manager: public and sharing

*Living Lab
Snap4City Hackathons*

Snap4City

LOGIN

- Dashboards (Public)
- Knowledge and Maps ▾
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager
- Development Tools ▲
  - Knowledge Base Graphs
  - Smart City API Docs: Swagger
  - Testing API by Postman
  - Source Code Access
- Management ▲
  - Smart City API Monitoring
  - Web Server Monitoring
  - Smart Decision Support Sys
  - Resilience Decision Support Sys
- Help and Contacts ▲
  - Help Desk and contacts
  - Contact Us, Problem Reporting
  - FAQ
  - Help Us with Your Feedback!!!
- Documentation and Articles ▾
- Km4City portal
- DISIT Lab portal

SNAP4CITY
KM4CITY

HACKATHON
BUILD YOUR APP FOR A CONNECTED CITY

Open from
Jan 21 - Mar 15

CLICK HERE TO SEE THE HACKATHON WINNERS

see interim winner Fast Rabbit

Hackathon Organization

- OnLine Hackathon 2019
  - **Call** 2019. https://www.snap4city.org/370
  - **Multiple Categories** to avoid mixing companies with students, professionals with lovers, etc.
  - **Locations**: Helsinki, Antwerp and Tuscany at the same time
  - Multidisciplinary judges
  - Intermediated checkpoint(s) to help teams to improve and strive them toward the goals.
- **Support**: 100% online
  - All training already accessible
  - All online tools and support
- Several Teams have been engaged
  - Engagement via social network and on the area
- Multiple selections to refine the solutions, :
  - https://www.snap4city.org/416
- Awards and price of different kinds
  - https://www.snap4city.org/449

Validation with developers

- Helsinki and Antwerp, plus Florence Training, CINI Challenge, ..
- 65 performed operational activities:
  - dashboards, IOT Applications, registering IOT devices, etc.
  - More than the 80% created both Dashboards and IOT Applications, thus validating the solution and the process of engaging them in working on the platform

The 65 users	left on platform	Average per day over last 90 days	Total activity 90 days
Number of IOT Applications	117	81,6	7341
Number of private IOT devices	27	25,5	2296
Number of public dashboards	11	6,2	562
Number of private dashboards	173	135,1	12159
Number of accesses to dashboards	--	33,9	3048
Number of minutes	--	337,1	30337

TOP

SNAP4INDUSTRY

Appliances and Dockers
Installations

Snap4City tech. for Industry 4.0

https://www.snap4city.org

100% OPEN SOURCE

ERP

13406

4.0

3D

Snap4Industry

- See **more** on https://www.snap4city.org/369

- Snap4City technology can be exploited on Industy and IOT solutions:

  - **Snap4Industry: Snap4City for Industry 4.0** (SLIDES)

  - **Scenario: 5G Enabled Water Cleaning Control**

  - **Scenario: High Level Control of Industrial Plant**

  - **Custom Synoptics and Widgets for Dashboards**

  - **The integration between data and devices: the Snap4City solution**

  –

External Services

Fleet management

IoT Devices/Edge

IoT Broker

Internet

SECURE

Admin

IoT Broker

DCS

PLC

IoT Devices/Edge

Industry Plant1.....

SCADA

PLC/ RTU

IoT Broker

IoT Devices/Edge

Industry Plant2......

IOT Applications

Dashboards and Apps
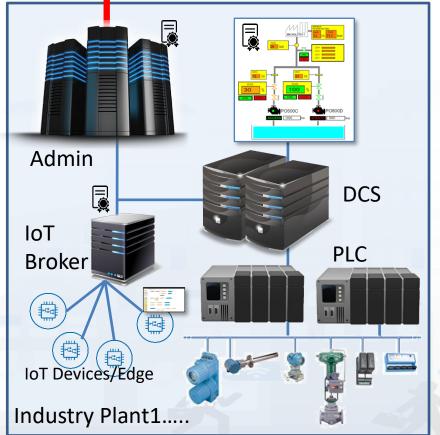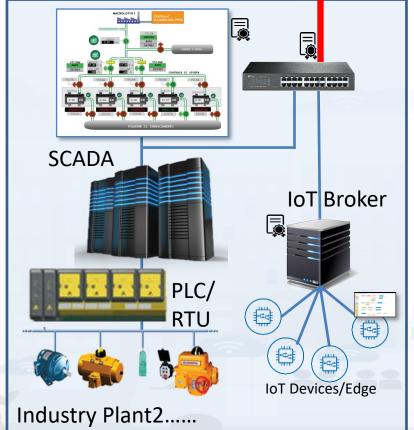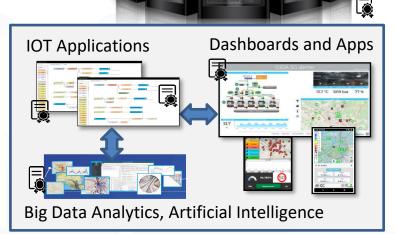
Big Data Analytics, Artificial Intelligence
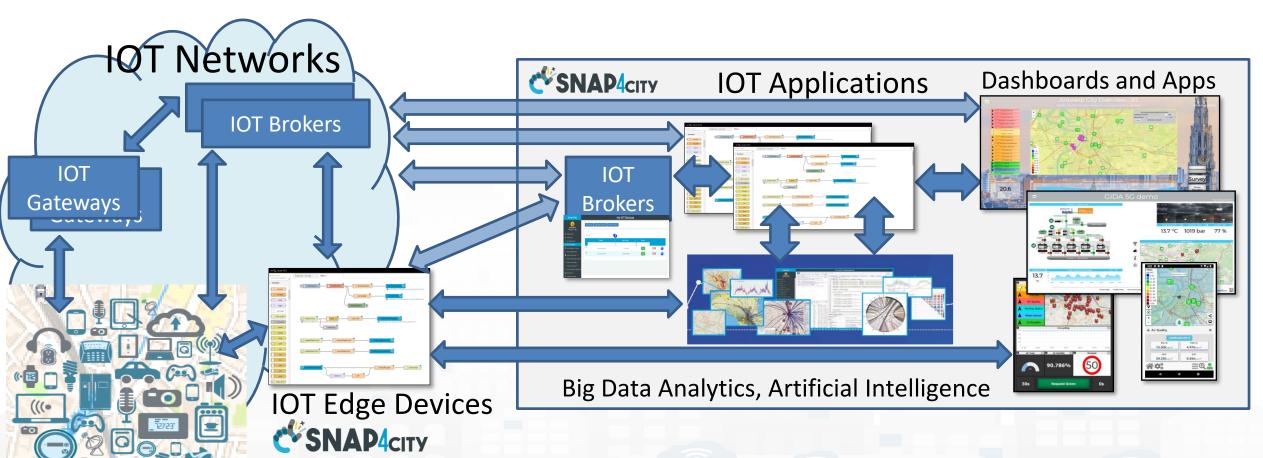
Control and Supervision on Multiple Supply Chains
Industry 4.0 as a Service

185

Snap4City Services also on IOT Edge!!!

Snap4City, Snap4Industry Architecture, V2 (2020)

Back-End → Front-End

Data Sources, External Services *PULL Data*

Data Sources, Brokers, External Services *Data Driven, Real Time*

Data Ingestion, aggregation, regularization, reconcile: IOT Directory, NIFI, special tools

Knowledge base Semantic Reasoners

Indexing and aggregating Elastic Search

Federation

Search and Query, Smart City API, Web Socket Server, GIS, Facet, semantic

Data Analytics, Simulations, Special Tools R Studio, Tensor Flow, Python, ...

IOT Applications, Business Logic Node-RED + Snap4City MicroServices

Rendering Acting, Widgets, Synoptics, MicroApps User interface, Drill down, maps, heatmaps

Inform, announce, Act!, warning, alarms, What-IF, ..

Authentication, Authorization, Platform & Processes Management, Data Inspector, Digital Twin, …

Security Architecture at a glance
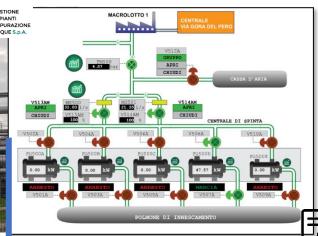
GIDA set up
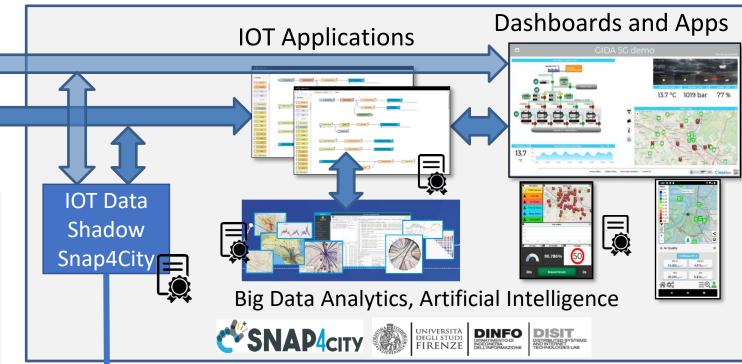
Demo UC5 GIDA

Altair
Chemical (I)
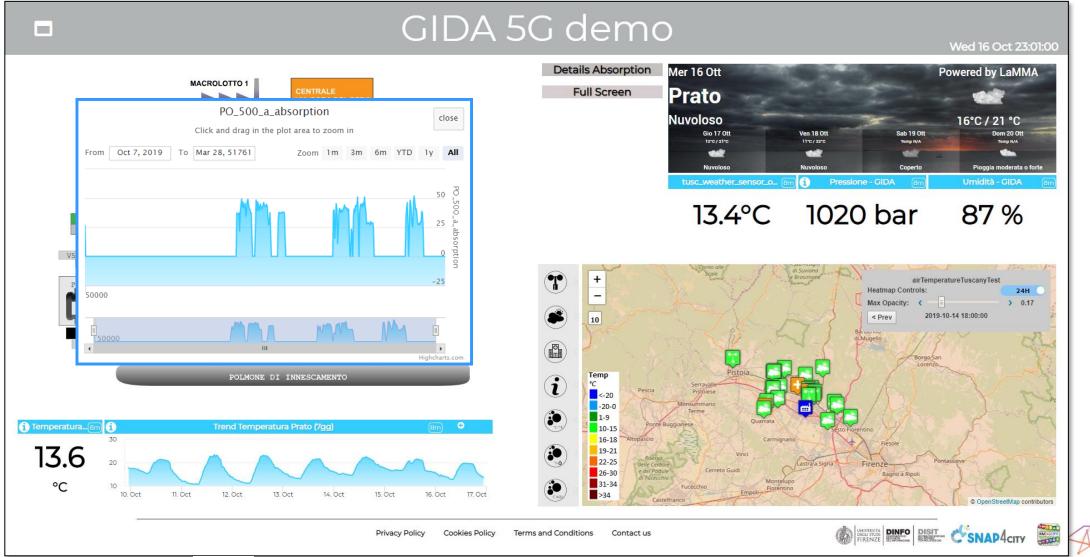
Snap4Altair Decision Support supervision and control, Industry 4.0

- **Multiple Domain Data**
  - Distributed Control System: energy, flows, storage, chemical data, settings, ..
  - Cost of energy
  - Orders
  - Production Parameters
  - Maintenance data

- **Multiple Levels & Decision Makers**

- **Historical and Real Time data**
  - Billions of Data
  - Optimized planning on chemical model
  - Business Intelligence on Maintenance data

- **Services Exploited on:**
  - Multiple Levels, Mobile Apps, API

- **Since 2020**
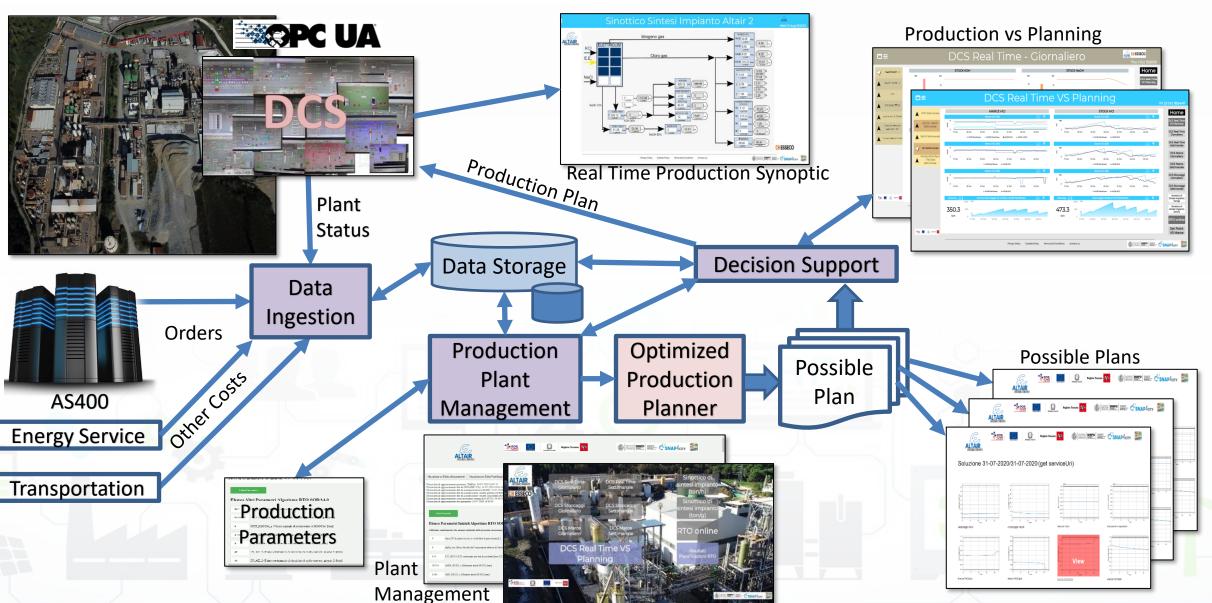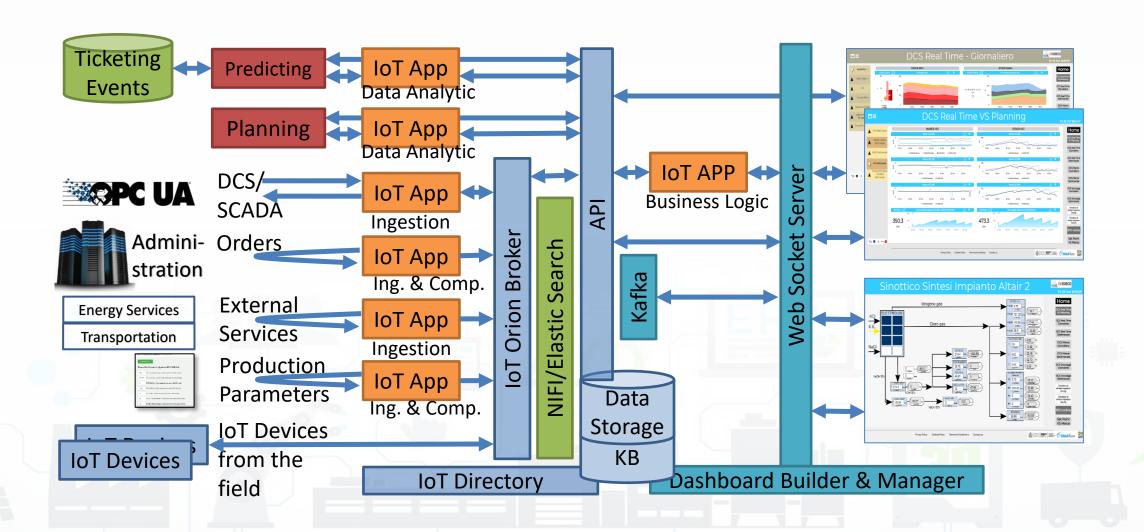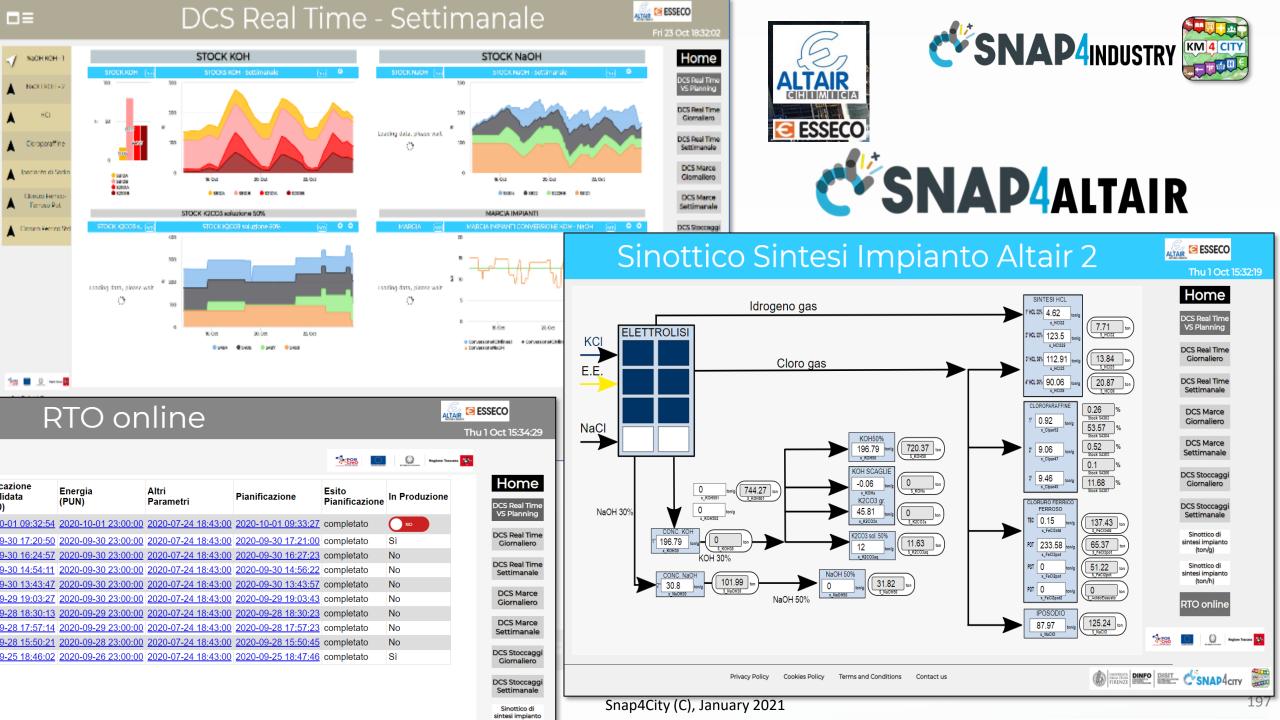
Production vs Planning

Real Time Production Synoptic

Production Plan

Plant Status

Data Storage

Decision Support

Data Ingestion

Orders

Other Costs

AS400

Energy Service

Transportation

Production Plant Management

Optimized Production Planner

Possible Plan

Possible Plans

Production Parameters

Plant Management

Business Logic

Produce Optimized Production Plan

Consolidated

No

Yes

set parameters

Data Storage

List of Active Orders

Consolidated Orders

Last Params

Take last DCS

Take last Energy

DCS Real Time - Giornaliero

DCS Real Time VS Planning

350.3

473.3

Planning result | Outcome | In production

Production Plan

Consolidated Orders

Optimized Production Planner

Possible Plans

Possible Plan

Soluzione 31-07-2020/31-07-2020 (get serviceUri)

View

Start Planning

Decision Support
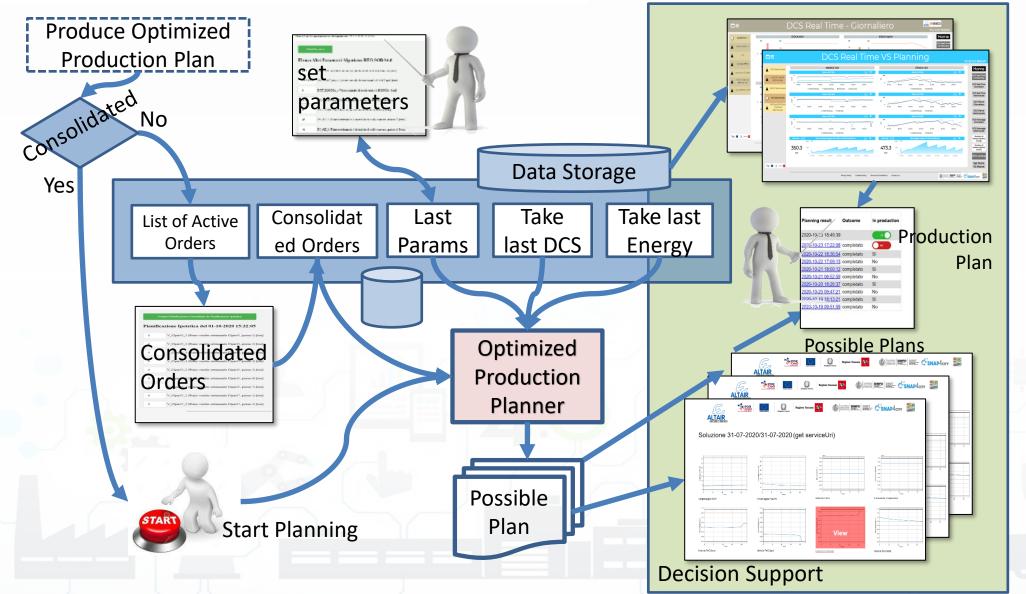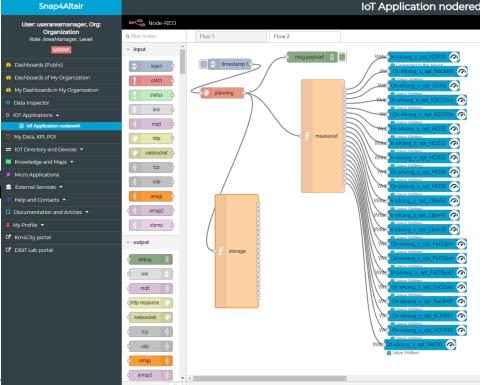
Some Flows

Green Impact Capacity (GIC)
Altair Control room

Green Impact Capacity (GIC)

- Improve productivity of chemical plant

- Keep GREEN the environmental impact

- Exploiting innovative technologies

- Diversify the production

- Monitoring environmental conditions

Installing Snap4City

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES

Installations

https://www.snap4city.org/471
To get an updated version read it!
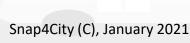
What we suggest since October 2020

- Exploit trial on Snap4City.org of your early solutions and concept, also exploiting the full support of Snap4 experts and community, on DISIT Organization or Multiple Org as you prefer

  – Please note that each Organization need a distinct email address and registration, and applies their own restriction to data and dashboards. So that maximum access to demonstrations is on DISIT Organization into Snap4city.org portal

- Ask/book for an Organization if you would like to test in a separate environment

- Once tested and convinced, start deploy your version on your premise by using «DataCity-Small» on Docker or VM

How to adopt Snap4City

Https://www.snap4city.org

Smart City as a Service
- Supporting Org
- 100% Open Source Platform: Github
- Further developments
- Publishing Appliances and Dockers
- Training courses, docs
- Consulting
- Forums
- Etc.

Download and deploy

On your premise

Installation on your premise
- Virtual Machines or Dockers
- Different configurations
    - From small to scalable
    - Exploiting your legacy tools
    - Interoperable with any tool
- No vendor lock-in, No tech lock-in

Mixed solutions! For example:
- Start on Cloud as Smart City as a Service
    - Migrate on premise on the fly
- Start on Cloud into a sand box
    - Pass to install on premise what you need

Snap4City, Snap4Industry Architecture, V2 (2020)

Back-End ⟷ **Front-End**

Data Sources, External Services
PULL Data

Data Sources, Brokers, External Services
Data Driven, Real Time

Data Ingestion, aggregation, regularization, reconcile:
IOT Directory, NIFI, special tools

Knowledge base
Semantic Reasoners

Indexing and aggregating
Elastic Search

Data Analytics, Simulations, Special Tools
R Studio, Tensor Flow, Python, ….

IOT Applications, Business Logic
Node-RED + Snap4City MicroServices

Federation

Search and Query, Smart City API, Web Socket Server, GIS, Facet, semantic

Rendering Acting, Widgets, Synoptics, MicroApps
User interface, Drill down, maps, heatmaps

Inform, announce, Act!, warning, alarms, What-IF, ..

Authentication, Authorization, Platform & Processes Management, Data Inspector, Digital Twin, …

Snap4City/Industry Architecture, V1, V2

Data Sources, External Services
PULL Data

Data Sources, Brokers, External Services
Data Driven, Real Time

Data Ingestion, aggregation, regularization, reconcile
- NIFI
- Tools, [ETL], DISCES,
- IOT Apps

Big Data Cluster
HDFS, Hbase, Phoenix

Knowledge base
Semantic reasoners

Indexing and aggregating
Elastic search

Data Analytics
R, Tensor Flow, Python, MapReduce, …

Visual Analytics

IOT Applications
Node-RED + Snap4City MicroServices

Search and Query, Smart City API
Facet, semantic search

Rendering Acting, Widgets, MicroApps
User interface, Interactive Dashboard, Drill down, maps, heatmaps

Inform, announce, Act!, warning, alarms, What-IF, ..

In Yellow alternative & legacy solutions: snap4city V1

Overview of Snap4City platform, for Buyers, for all

Other Services And Servers

IOT brokers

Cluster for Smart Processes container: ingestion, analytics, scraping, etc.

Cluster for big data storage: static and real time, Indexing and search

IOT Networks	Social Media	CRM	.....	GIS

Legacy Platform

Snap4City MAIN
Dashboard, User Management, etc.

Knowledge base, semantic Store
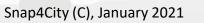
HeatMaps and Maps

Living Lab Portal

Mobile Apps, Dashboards

Back End

Front End

Overview of Snap4City platform, for Buyers, for all

Services
- CKAN DataGate
- Routing Server
- Chat Manager
- R Studio Server
- ETLSDK Server
- Engager Server
- .... Server

IOTOBSFs
- IOTBrokers, secure
- IOTBrokers, secure

Container Cluster
MCLSCont, NCLSCont
Marathon, Mesos, Zookeeper, Disces-EM, Executing in Container:
IOT App, Web Scraping, R-Studio, Python, Java, ETL, ...

[DataCluster]
ETL-VM
Phoenix HBASE, HDFS
DISCES, ETL support

Data Shadow Cluster
IOTDSES
NIFI, Elastic Search, DevDash, Amma

IOT Networks | Social Media | CRM | ..... | GIS

Legacy Platform

Snap4City MAIN
Dashboard Builder,
Data Inspector, User Stats,
ExternalSrv, Res Manager,
MyKPI, MyPOI, Synoptic, IOT
Device Manager, Micro
Applications, Authorization/
Authentication, Roles, …

KBSSM
KB/ServiceMap, ..
SmartCity API, WFS,
ServiceMap3D, LOG/FLINT,
SuperServiceMap, Virtuoso

GISGeoServer
Heatmap Manager,
WFS, WMS

Living Lab Portal
Drupal support CRM, ..

Mobile Apps, Dashboards

Back End

Front End

What is included in the Buyers / Full Platform

- **IOTOBSF**
  - IOT Orion Broker Fi-Ware
  - Secure Filter (Snap4City)
- **IOT Edge support**
  - Linux Ubuntu
  - Windows
  - Raspberry Pi
  - Android
- **IOT Devices support**
  - ESP32
  - Arduino
- **IOT Application**
  - Node-RED
  - Snap4City Library of nodes
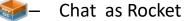
- **Other Services**
  - Routing Server
  - DataGate CKAN
  - Chat as Rocket
  - ETL SDK VM
  - Engager ..
  - …..
- **Data Analytics**
  - Heatmap production MS Rstudio
  - OD production
  - Predictions MS RStudio
  - Anomaly detection MS RStudio
  - ETL Collection
  - ….

- **MCLSCount, NCLSCount Container[Cluster]**
  - Containers models
  - DISCES-EM
  - Monitoring App
- **ETL Server Data[Cluster]**
  - DISCES
  - Phoenix Drivers
  - Hbase Model
  - ETL processes
- **IOTDSES DataShadow[Cluster]**
  - NIFI process, Squid
  - Elastic Search Model
  - Kibana
  - AMMA data flow
  - DevDash data store

- **KBSSM**
  - Knowledge Base Km4City
  - ServiceMap
  - ServiceMap3D
  - SuperServiceMap
  - LOG/Flint
  - OSM2Km4City
  - Smart City API
  - WFS API
- **GIS GeoServer**
  - GeoServer
  - Heatmap Manager
- **Living Lab Portal**
  - CRM Drupal
  - LDAP Snap4City
  - Registration mng
  - Etc. etc.

- **Snap4City MAIN**
  - Dashboard Builder, Wizard
  - Dashboard Engine
  - Data Inspector, Notificator
  - External Srv manager
  - Menu Manager
  - Ownership Manager
  - Authentication and Authorisation
  - WS server
  - Resource Manager
  - User Stats
  - JavaScript Web App in a Snap, MicroApplications
  - Synoptics, custom Widgets
  - IOT device manager: IOT Directory
  - Snap4City MicroServices on IOT Applications: basic and advanced
  - Snap4City GIS Player
  - What-IF tools

All in source code, and most of components in Appliances/VMs

Platform Maintenance, K3.14

- **Snap4City modules** are released on GITHUB/DISIT and can be updated from:
  - GITHUB/DISIT into VM Appliance or Servers in which they are installed
    - https://github.com/disit
  - Node-RED tool, using official Library regarding: Snap4City Libraries

  - Drupal for the Living-Lab Portal aspects
  - Other tools from their corresponding providers
- **Maintenance** would not be a problem, all users should be capable to perform the updates autonomously
- Updates on new versions will be provided by Snap4City periodically, Notification will be provided on NEWS and GitHUB

Keeping Platform at the State of The Art

- **Updates** will be provided by Snap4City periodically and released on GITHUB, and other portals.

- **Snap4City team** is involved in contracts since now, so that this will guarantee that the solution will be evolved to anticipate the state of the art as we have done in Iteration 3, in which we released a number of developments.
  - See also the activity of dissemination and updated roadmap
  - See the presence of Snap4City on EOSC, BeeSmartCity, EO15, etc.
  - See the list of concreate developments
  - See the list of supporters on the Stand with respect to those of the 2018
  - See the planned new developments

Set-up of Open Source version from Scratch

- **Guidelines reported on:**
  - https://www.snap4city.org/471

- **How to proceed:**
  - We have presented 7 Configurations models from **A:Alone** to **F:FullPlatform+LivingLab, but they can be customized as you like.**
  - **By follow the Configurations** the Customers are guided to identify the most suitable according to their needs;
  - Once the most suitable Configuration has been identified, they are supported into the:
    - i. Download and deploy of the Appliances provided as Virtual Machines or Containers, or
    - ii. Download and install modules from GITHUB according to the recipes for VM/Container and the user manual of the single tools, or
    - iii. Mixt of the above (i) and (ii) approaches.
  - **IOT Edge** can created by (1) installing Node-RED, (2) adding Snap4City library of Nodes from the Palette Manager of Node-RED, (3) registering on Snap4City: https://nodered.org/docs/user-guide/editor/palette/manager

Note that some of the material we are presenting has not been published on the portal yet, for the competition.

Snap4City Scalable Platform with your business

Configuration Kind	Min #VM	Dockers	IOT Broker int	IOT Broker Ext	MAP	KBSM	IOT APP, MicroServices	Storage & IOT Data Shadow	SSO, Roles	IOT Security	Dash + Wizard	GIS in	GIS out	Heatmap	Mob. App	ASCAPI	Living Lab Sup.	Options supported by the configuration
A: Alone	1	6	X	X			1 mf		X	X	X	X				(x)		ETL, DG, CM
B: Basic	2	7	X	X	X		1 mf	Small	X	X	X	X				(x)		ETL, DG, CM
C: CityStart	3-4	8-9	X	X	X	X	1 mf	Small	X	X	X	X	X	X	X	X		ETL, DG, R, CM, Eng
D: DataCity	5-6	Ask	X	X	X	X	70	Medium	X	X	X	X	X	X	X	X		ETL, DG, R, CM, Eng, LL
E: ExtensiveCity	6-8+	Ask	X	X	X	X	70	Scalable	X	X	X	X	X	X	X	X		ETL, DG, R, CM, Eng, LL
F: FullPlatform	12-14+	Ask	X	X	X	X	Scalable	Scalable	X	X	X	X	X	X	X	X		ETL, DG, R, RS, CM, Eng, LL
F: FullPlatform + LivingLab	13-15+	Ask	X	X	X	X	Scalable	Scalable	X	X	X	X	X	X	X	X	X	ETL, DG, R, RS, CM, Eng

mf: multiple flows for each IOT App

Read next slide for the other notes and legenda

Legenda and Notes on the previous table

- **In all configurations you:**
  - **have**: Multiple IOT Brokers; unlimited number of data sources; interoperability support; KB
  - **may have**: HA, DRS, FT, Balancing, cloning and configuring additional VM;
  - **may pass** at the next configuration without reinstalling the VM;
  - **may add** one or more Optional Services as VM/Containers: ETL, DataGate, Routing, Engager, Data Analytics, etc. etc.
- **From Config. E:ExtensiveCity and upper the number of VMs depends on the volume of DataStorage and the volume of Data Stream in input.**
  - These two aspects are managed by two independent clusters of VMs and scale independently each other. This allows to satisfy any different combination of volumes in streams and data storage.
- **We suggest** using Living Lab support only on FullPlatform, while it can be installed on Smaller Configurations with some limitations in terms of features

Optional Services
- **DG: DataGate CKAN**
- **R: Routing**
- **ETL: ETL SDK VM**
- **RS: R Studio Server**
- **Eng: Engager**
- **CM: Chat Manager**
- **LL: Living Lab**
- ..
- ..

Computational and Storage Costs

- **The VM** is considered (appliances are provided) as 16/24 cores 2.2 Ghz, 16-24 GB Ram, 500 GB HD in thin provisioning, with 25-40 GB HD used at the start, in most cases Debian.
  - to estimate the needed CPU, RAM, Storage for each configuration it is easy from the #of VM in the configuration.
  - Please note that configurations A and B can be executed on 4 cores, 4 GB Ram, ..

- **In solutions**, with a very large number of users on the Front End: Smart City API (mobile App users, Dashboard users, a frontend balancer and more FrontEnd servers would be needed). Please note that the Smart City API are also used by DataAnalytics processes and by MicroServices in the IOT Applications.
  - Typically a thousand of simultaneous users on the front end can be sustained for each VM
  - More precise estimations can be performed by knowing the actual workload

Ds) DataCity-small Configuration and its evolution in DataCity-Large

Smart City Functional Architecture

Transport systems Mobility, parking

Public Services, Govern, events, …

Sensors, IOT Cameras, Wi-Fi

Environment, Water, energy

Shops, services, operators

Social Media

Social Media Crawler and Manager

Data Sources, External Services *PULL Data*

Data Sources, Brokers, External Services *Data Driven, Real Time*

← **Back-End** — **Front-End** →

Data Ingestion, aggregation, regularization, reconcile: IOT Directory, NIFI, special tools

Knowledge base Semantic Reasoners

Indexing and aggregating Elastic Search

Federation

Search and Query, Smart City API, Web Socket Server, GIS, Facet, semantic

Data Analytics, Simulations, Special Tools R Studio, Tensor Flow, Python, ….

IOT Applications, Business Logic Node-RED + Snap4City MicroServices

Rendering Acting, Widgets, Synoptics, MicroApps User interface, Drill down, maps, heatmaps

Inform, announce, Act!, warning, alarms, What-IF, ..

Authentication, Authorization, Platform & Processes Management, Data Inspector, Digital Twin, …

D: DataCity-Small) A small size Smart City with a 4 smart applications on cloud and 2 of IOT brokers, limited volume of data entering into the cloud.

Services
CKAN DataGate

Optional

IOTOBSFs

Node RED

Node RED

IOTDSES

kibana

elasticsearch

APACHE nifi

IOT Broker
IOT Context Broker
ProxyFilter Security

Snap4CityMAIN
Dashboard Builder
Wizard, Widgets, IOT App1
Notificator, WS Server,
Data Inspector, User Stats,
ExternalSrv, Resource
Manager, MicroApps
Authorization/Authentic.
MyKPI, MyPOI, Synoptic
IOT Directory

SmartCityAPI **KBSSM**
KB/ServiceMap
ServiceMap3D
LOG/FLINT
Virtuoso
ASCAPI

D: DataCity) A medium/large size Smart City with a number of smart applications on cloud and a number of IOT brokers, relevant volume of data entering into the cloud.

For Managing

Beyond C:CityStart Configuration

- **IOTDSES DataShadow[Cluster]**
  - NIFI process
  - Elastic Search Model
  - AMMA and DevDash

+ A limited number of IOT Applications for data transformation and Analytics

+ A small sized Data Shadow for IOT data management

Optionally:

- Data Gate CKAN for Open Data
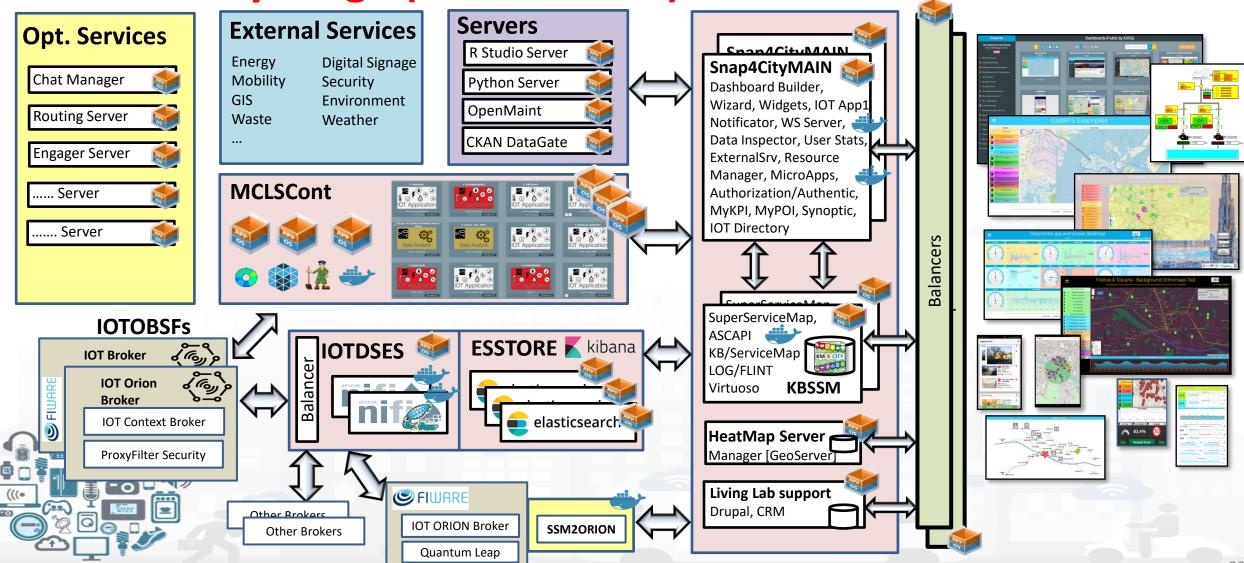
DCL: DataCity-Large (2020 edition)

Opt. Services
- Chat Manager
- Routing Server
- Engager Server
- ...... Server
- .... Server

External Services
- Energy
- Mobility
- GIS
- Waste
- ...
- Digital Signage
- Security
- Environment
- Weather

Servers
- R Studio Server
- Python Server
- OpenMaint
- CKAN DataGate

Snap4CityMAIN
Dashboard Builder, Wizard, Widgets, IOT App1 Notificator, WS Server, Data Inspector, User Stats, ExternalSrv, Resource Manager, MicroApps, Authorization/Authentic, MyKPI, MyPOI, Synoptic, IOT Directory

MCLSCont

IOTOBSFs

IOT Broker

IOT Orion Broker
- IOT Context Broker
- ProxyFilter Security

IOTDSES

ESSTORE kibana

elasticsearch

SuperServiceMap
SuperServiceMap, ASCAPI, KB/ServiceMap, LOG/FLINT, Virtuoso
KBSSM

HeatMap Server
Manager [GeoServer]

Living Lab support
Drupal, CRM

Balancer

Other Brokers

Other Brokers

FIWARE
- IOT ORION Broker
- Quantum Leap

SSM2ORION

Balancers

Snap4City (C), January 2021

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Federation of Snap4City vs IOT ORION Broker

A) Alone Configuration

A: Alone) For Small Size Business, for example an industry 4.0 application you can need to install only one VM: Snap4CityMAINVM

- **Snap4City MAIN VM**
  - Dashboard Builder, Wizard
  - Dashboard Engine
  - Data Inspector, Notificator
  - External Srv manager
  - Menu Manager
  - Ownership Manager
  - Authentication and Authorisation
  - WS secure server
  - Resource Manager
  - User Stats
  - JavaScript Web App in a Snap, MicroApplications
  - Synoptics, custom Widgets
  - IOT device manager: IOT Directory
  - Snap4City MicroServices on IOT Applications: basic and advanced
  - Snap4City WFS player
  - What-IF tools

External Data Stores

Snap4CityMAIN
Dashboard Builder Wizard, Widgets Notificator, WS Server, Data Inspector, User Stats, ExternalSrv, Resource Manager, MicroApps Authorization/Authentic. MyKPI, MyPOI, … IOT Applications, Synoptic, Snap4City WFS GIS player, IOT Device Manager….

- **For connecting data sources to Dashboards onpremise!**
  - *Data driven solution, no large data store*
  - *Industry 4.0*
  - *Small Smart City business, no knowledge basse, no servicemap*
  - *Start with Snap4City platform as seeding element*
  - *Storage: ODBC, JDBC, Mongo, SPARQL, MySQL, etc.*

Snap4CityMAIN: Alone Configuration

- ## As Virtual Machine:
  - HOW TO: configure/install StartSNAP4CITYVM: starting appliance of Snap4City
  - https://www.snap4city.org/487

- ## As Container Composer:
  - HOW TO: configure/install StartSNAP4CITYVM: starting appliance of Snap4City
  - https://github.com/disit/snap4city-docker/tree/master/Alone

B) Basic Configuration
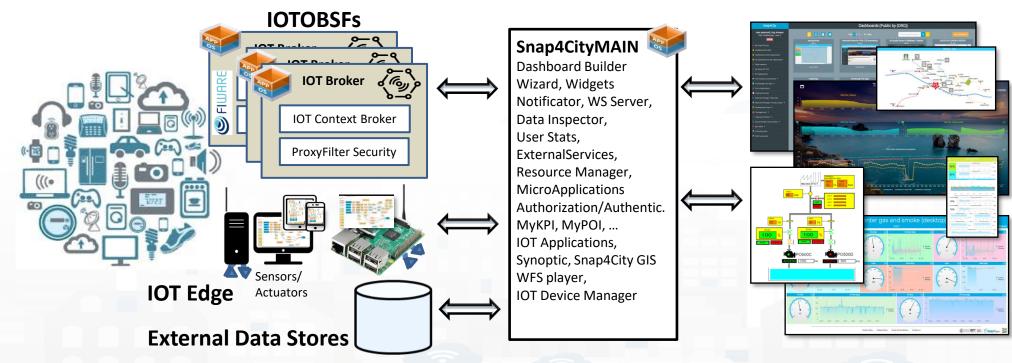
B: Basic) Addressing a relevant number of IOT devices/ IOT brokers, a few smart Applications

- **IOTOBSF VM**
  - IOT Orion Broker Fi-Ware
  - Secure Filter (Snap4City)

- **IOT Edge support**
  - Linux Ubuntu
  - Windows
  - Raspberry
  - Android
  - Snap4City Library of nodes

- **IOT Devices support**
  - ESP32
  - Arduino

- **IOT Application**
  - Node-RED
  - Snap4City Library of nodes

- **IOT Edge:** local intelligence, processes and Applications located on the field, on premise. Those autonomous smart tools can be implemented by IOT Applications working on IOT Edge:
  - **Linux Ubuntu Appliance VM**: https://www.snap4city.org/drupal/node/298
  - **Android as IOT Edge** https://www.snap4city.org/drupal/node/278 and
  - **Raspberry Pi as IOT Edge**: https://www.snap4city.org/drupal/node/77 You can install Snap4City library in any Node-RED from the official Node-RED library

- **IOT Applications = Node-RED + Snap4City libs of Nodes/MicroService**s,
  - Available in **Snap4CityMAIN VM**, so that in any installation
  - any installation of Node-RED add Snap4City Library from the official Library of Node-RED, add new Nodes into the Palette as
    - https://nodered.org/docs/user-guide/editor/palette/manager
  - Snap4City MicroService collection from the JS foundation with full documentation inside https://flows.nodered.org/?term=snap4city
    - **BASIC: suitable for Final User**
    - **ADVANCED: DEVELOPER** (you have to install both libraries: basic and advanced)
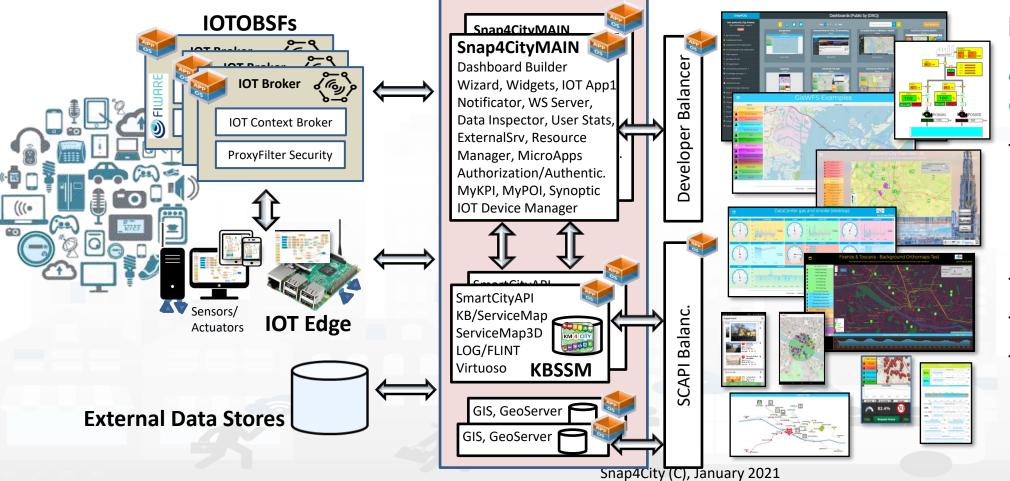
C) CityStart Configuration

C: CityStart) Addressing a relevant number of **GeoLocated Points** of Interest, PIN on maps, and **eventually heatmaps**, a Small Smart City with a few smart IOT applications on cloud and many on edge

IOTOBSFs

IOT Broker
IOT Broker
IOT Broker
IOT Context Broker
ProxyFilter Security

Sensors/Actuators

IOT Edge

External Data Stores

Snap4CityMAIN
Dashboard Builder
Wizard, Widgets, IOT App1
Notificator, WS Server,
Data Inspector, User Stats,
ExternalSrv, Resource
Manager, MicroApps
Authorization/Authentic.
MyKPI, MyPOI, Synoptic
IOT Device Manager

SmartCityAPI
SmartCityAPI
KB/ServiceMap
ServiceMap3D
LOG/FLINT
Virtuoso
KBSSM

GIS, GeoServer
GIS, GeoServer

Developer Balancer

SCAPI Balanc.

For managing

Beyond B:Basic Configuration

+ Large number of GEO elements on maps

+ Heatmaps

+ Geo shapes

+ GIS, ….

Snap4City (C), January 2021

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C: CityStart) Addressing a relevant number of GeoLocated Points, heatmaps, …

- **KMSSM VM:**
  - knowledge base, KB, positioning elements on maps, enabling geo-spatial and temporal reasoning
  - Ingestion OSM to load on KB, ServiceMap and reasoning on it
  - GeoReverse data, from street to data and vice versa
  - WFS export and import
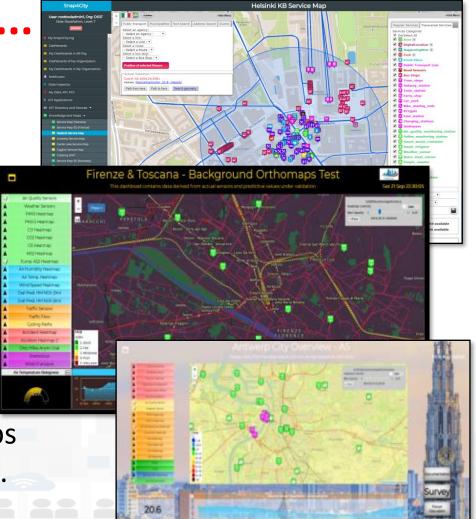
- **GIS GeoServer VM:**
  - Producing and providing heatmaps
  - Managing Heatmaps colour maps.
  - WMS, WFS export, distribution
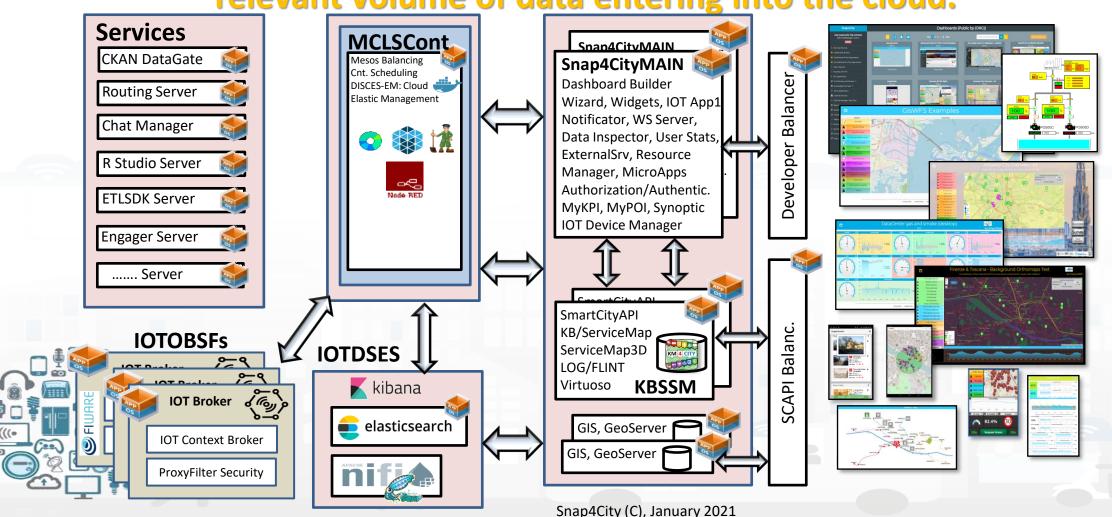
- **KBSSM VM**
  - Knowledge Base Km4City
  - ServiceMap
  - ServiceMap3D
  - SuperServiceMap
  - LOG/Flint
  - OSM2Km4City
  - Smart City API
  - WFS API

- **GIS GeoServer VM**
  - GeoServer
  - Heatmap Manager

D) DataCity Configuration

D: DataCity) A medium/large size Smart City with a number of smart applications on cloud and a number of IOT brokers, relevant volume of data entering into the cloud.

D: DataCity) A medium/large size Smart City with a number of smart applications on cloud and a number of IOT brokers, relevant volume of data entering into the cloud.

- **MCLSCount Container[Cluster]**
  - Containers models
  - DISCES-EM
  - Monitoring App

- **ETL Server Data[Cluster]**
  - DISCES
  - Phoenix Drivers
  - Hbase Model
  - ETL processes

- **IOTDSES DataShadow[Cluster]**
  - NIFI process
  - Elastic Search Model
  - AMMA and DevDash

For Managing
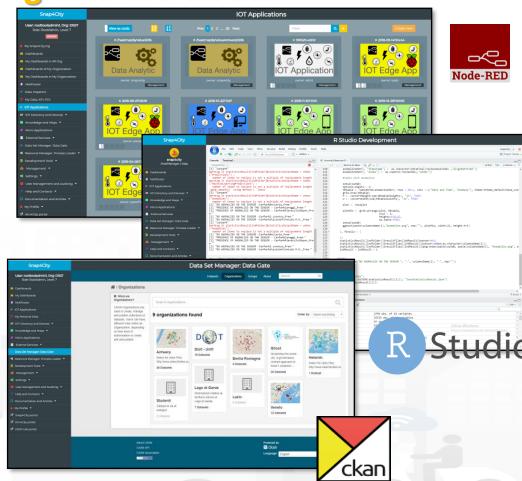
Beyond C:CityStart Configuration

+ A relevant number of IOT Applications for data transformation and Analytics

+ A small sized Data Shadow for IOT data management

Optionally:

- Data Analytics in R Studio, Tensor Flow (NVIDIA)
- Hbase / Phoenix Big Data Store
- Data Gate CKAN for Open Data
- Chat Manager on Dashboard
- Routing Solutions

E) ExtensiveCity Configuration
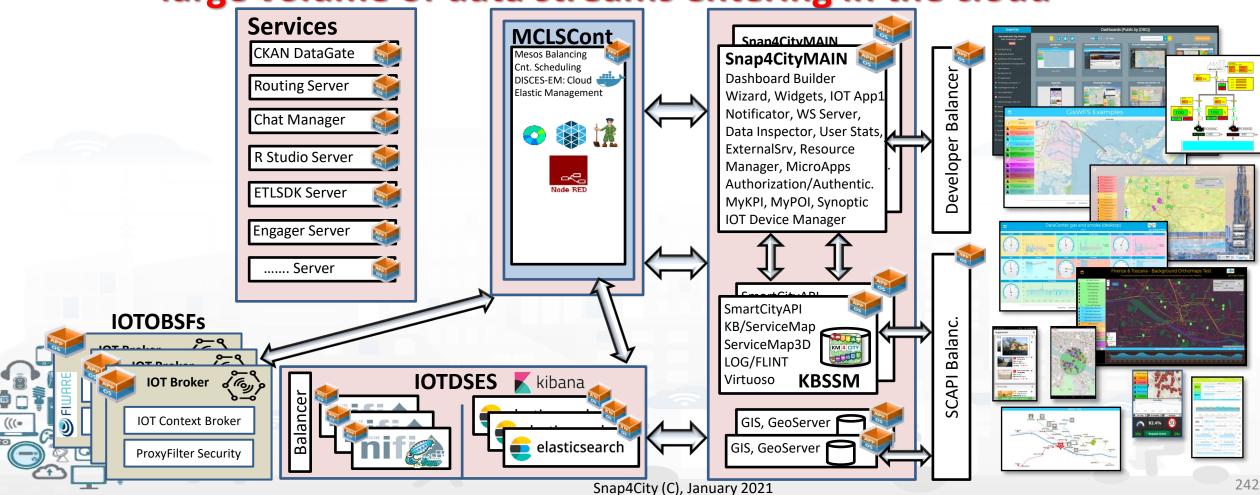
E: ExtensiveCity) A Large size Smart City with smart applications on cloud and a number of IOT brokers,
large volume of data streams entering in the cloud

E: ExtensiveCity) A Large size Smart City with smart applications on cloud and a number of IOT brokers, large volume of data streams entering in the cloud

- **IOTDSES DataShadow Cluster**
  - NIFI process
  - Squid cache on SCAPI
  - Elastic Search Model extended API
  - Kibana
  - AMMA data flow
  - DevDash data monitor
  - …

For Managing

Beyond D:DataCity Configuration

+ A relevant number of data streams entering in the platform
+ A scalable Data Shadow for IOT data management

Optionally:

- Data Analytics in R Studio, Tensor Flow (NVIDIA)
- Hbase / Phoenix Big Data Store
- Data Gate CKAN for Open Data
- Chat Manager on Dashboard
- Routing Solutions

F) FullPlatform Configuration

F: FullPlatform) For Huge scale Smart City with a Huge number of smart applications and processes on cloud (thousands), any number of IOT brokers

VM on Cloud HA, DRS, [FT]
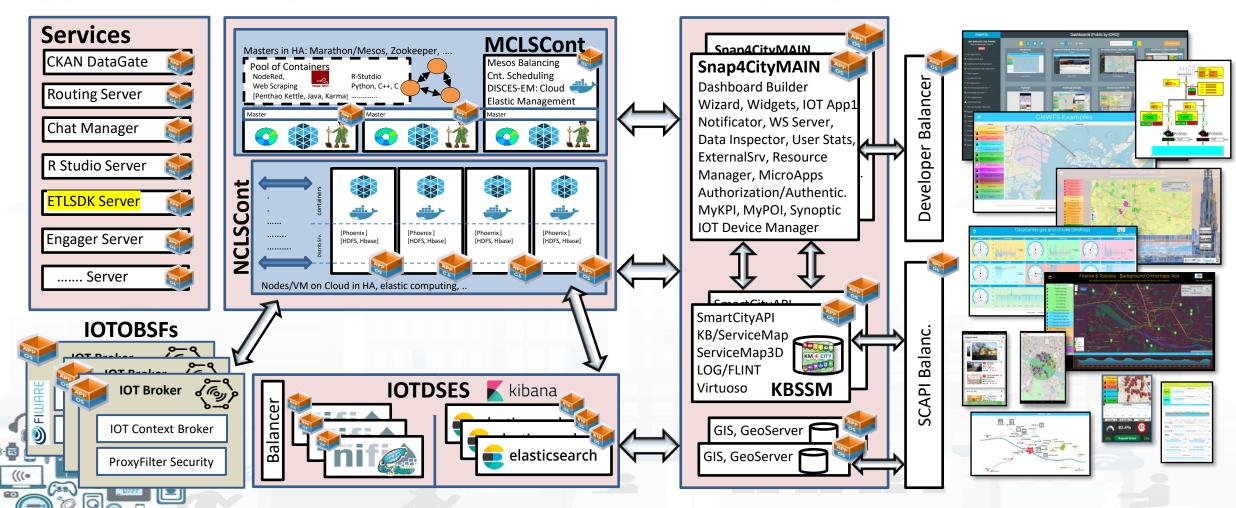
F: FullPlatform) For Huge scale Smart City with a Huge number of smart applications and processes on cloud (thousands), any number of IOT brokers

- **MCLSCount**
- **NCLSCount**
  Container[Cluster]
  – Marathon, Mesos Cluster
  – Containers models
    - IOT App
    - Web Scraping
    - Data Analytics
    - ETL
    - Python
    - ..
  – DISCES-EM
    - Elastic management of containers
  – Monitoring App
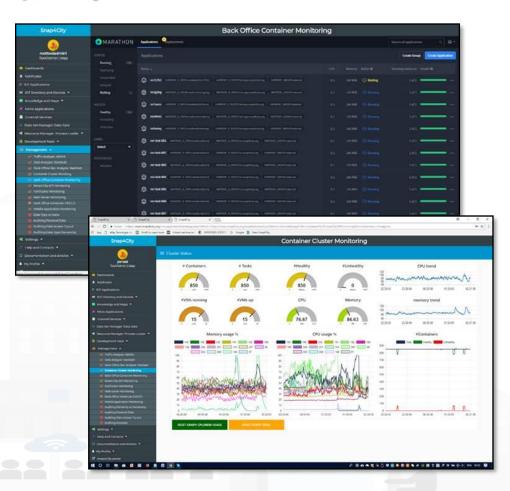
For Managing

Beyond E:ExtendedCity Configuration

+ A scalable huge number of Containers including different kind of processes: IOT, ETL, data analytics, scraping
+ A scalable Data Shadow for IOT data management

Optionally:

- Data Analytics in R Studio, Python, Tensor Flow (NVIDIA), etc.
- Hbase / Phoenix Big Data Store
- Data Gate CKAN for Open Data
- Chat Manager on Dashboard
- Routing Solutions

F+) LivingLab Configuration

F-LivingLab: FullPlatform + LivingLab) For Huge scale Smart City as Full Platform plus Living lab Support

Services
- CKAN DataGate
- Routing Server
- Chat Manager
- R Studio Server
- ETLSDK Server
- Engager Server
- ……. Server

IOTOBSFs
- IOTBrokers, secure

Container Cluster
MCLSCont, NCLSCont

Marathon, Mesos, Zookeeper, Disces-EM, Executing in Container: IOT App, Web Scraping, R-Studio, Python, Java, ETL, …

[DataCluster]
ETL-VM

Phoenix HBASE, HDFS
DISCES, ETL support

Data Shadow Cluster
IOTDSES

NIFI, Elastic Search, DevDash, Amma

Legacy Platforms
- IOT Networks
- Social Media
- CRM
- …..
- GIS

Snap4City MAIN
Dashboard Builder,
Data Inspector, User Stats,
ExternalSrv, Res Manager,
MyKPI, MyPOI, Synoptic, IOT
Device Manager, Micro
Applications, Authorization/
Authentication, Roles

KBSSM
KB/ServiceMap,
SmartCity API, WFS,
ServiceMap3D, LOG/FLINT,
SuperServiceMap, Virtuoso

GISGeoServer
Heatmap Manager,
WFS, WMS

Living Lab Portal
Drupal support CRM

Mobile Apps, Dashboards

In Yellow alternative & legacy solutions including ETL

Snap4City (C), January 2021

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F-LivingLab: FullPlatform + LivingLab) For Huge scale Smart City as Full Platform plus Living lab Support

Living Lab Portal
- CRM Drupal
- LDAP Snap4City
- Blogs, Articles, comments, etc.
- Multiple Organization
- Multiple Groups
- SSO with Snap4City tools
- Automated Registration management
- SOLR indexing on content
- Monitoring activity
- Reporting and statistics
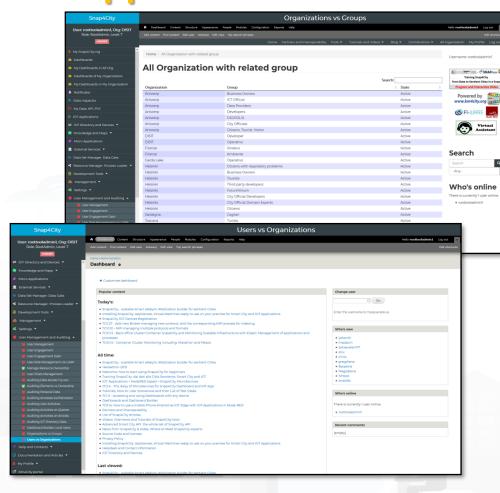
For Managing

Beyond F:FullPlatform Configuration

+ Providing Living Lab Support, a full CRM for stakeholder, co-working, collaborative work, discussion environment, chart, forum, etc.

Strongly suggested:
- Data Analytics in R Studio, Python, Tensor Flow (NVIDIA), etc.
- Hbase / Phoenix Big Data Store
- Data Gate CKAN for Open Data
- Chat Manager on Dashboard
- ETL SDK servers
- User Engagement Server
- Routing Solutions

Snap4City/Industry Architecture, V1/V2

Data Sources, External Services
PULL Data

Data Sources, Brokers, External Services
Data Driven, Real Time

Data Ingestion, aggregation, regularization, reconcile
- NIFI
- Tools, [ETL], DISCES,
- IOT Apps

Big Data Cluster
HDFS, Hbase, Phoenix

Knowledge base
Semantic reasoners

Indexing and aggregating
Elastic search

Data Analytics
R, Tensor Flow, Python, MapReduce, …

Visual Analytics

IOT Applications
Node-RED + Snap4City MicroServices

Search and Query, Smart City API
Facet, semantic search

Rendering Acting, Widgets, MicroApps
User interface, Interactive Dashboard, Drill down, maps, heatmaps

Inform, announce, Act!, warning, alarms, What-IF, ..

In Yellow Alternaive Snap4City V1

Roles in Snap4City/Industry solutions

- **RootAdmin**
  - The gods of the specific installation, access to all tools for all Organizations
- **ToolAdmin**
  - The administrators of an Organization with some capabilities on single tools
- **AreaManager**
  - Typical developer capabilities, access to development tools, access to a wider number of resources, IOT with both basic and advanced, IOT Models, etc.
- **Manager**
  - Final users, limited access to development, IOT App development with Basic library.

- **Users of any Role** have full control on their own resources: data, devices, dashboards, IOT App, etc., which may control according to GDPR rules,
  - providing access, revoking, etc.
- **All users start as Manager roles**
  - All users have also a Level (numeric). A score about what they have exploited in the platform. Higher scores correspond to wider exploitation of capabilities.
- **RootAdmin users may**
  - pass Users to higher roles. Ask to snap4city@disit.org to become an AreaManager for testing
  - Provide/grant specific authorizations to data access on Tool usage
- In the Installation onPremise, you become the RootAdmin of it, you decide ALL.

Management by Organization

- **Organizations** may have
  - name, ID, GPS center, a number of Groups on Snap4City.org (living lab support Drupal)
  - users of different kinds and may impose early bounds on the resourced used by users (IOT Dev, IOT App, Dash)
  - on cloud user kinds up to level of Tool Administrator
  - One or more ServiceMap and boundaries for the federation

- **ToolAdmin** users (requested by Organizations) may
  - control processes, consumption of resources, healthiness, etc.
  - manage tools exploited in your configuration

- **24H/7D Help Desk and Assistance**

RootAdmin

- RootAdmin on Snap4City.org has a very large set of tools
  - Dashboards
  - **Extra Dashboard Widgets**
  - Notificator
  - **Data, My Data, OpenData**
  - **Knowledge and Maps**
  - **IOT Applications**
  - **IOT Directory and Devices**
  - **Resource Manager**
  - **Development Tools**
  - **Management**
  - **Decision Support Systems**
  - **Settings**
  - **User Management and Auditing**
  - Help and Contacts
  - Documentation and Articles
  - ....

In this section of the slides, those market in bold are presented.
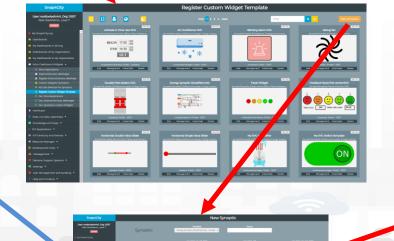
Extra Dashboard Widgets
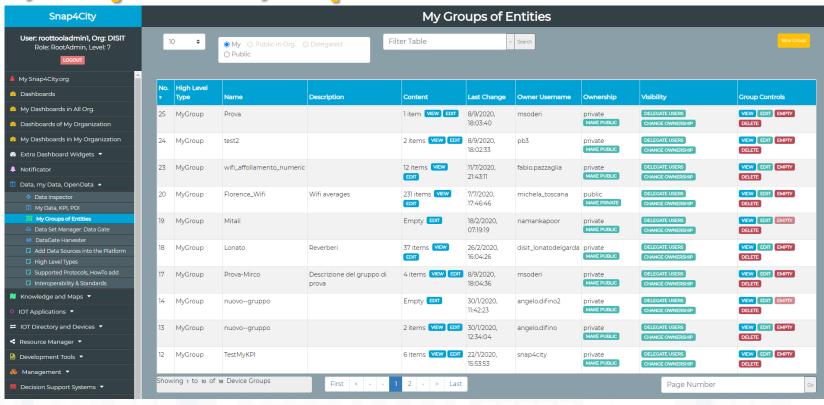
Data, My Data, OpenData

- Data Inspector

- MyData, MyKPI, MyPOI management

- **My Groups of Entities**
  - **Licensing group of Entities in One Click**

- DataGate, CKAN

- DataGate harvesting setting

- For non admin tools see other Training parts: https://www.snap4city.org/577
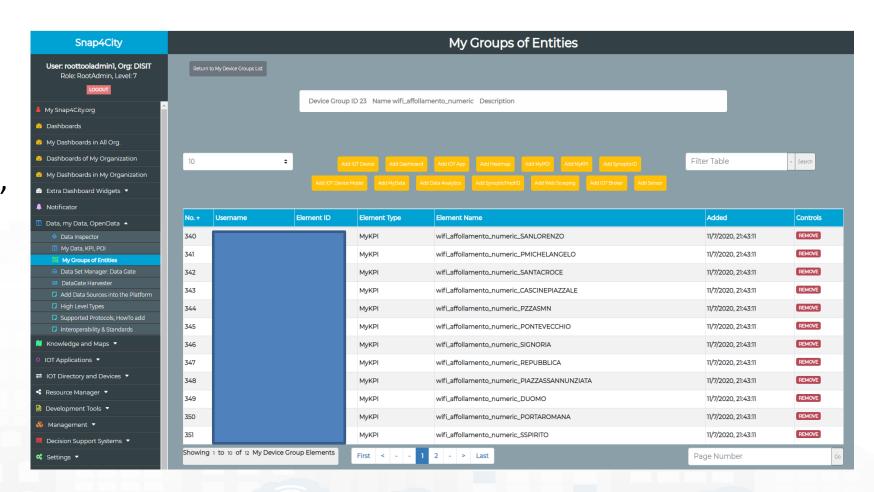
Group of entities

- A group may include a number of:
  - IOT Devices, Dashboards, MyPOI, MyKPI, Synoptics, IOT DeviceModels, MyData, Synoptics Templates, IOT Brokers, IOT Sensors/actuators,..

- Once the Group is created, the group owner can:
  - Produce a license to grant access at all the Group Entities in one click

Knowledge and Maps
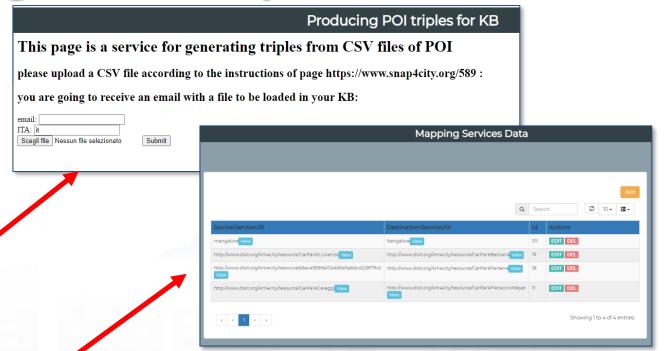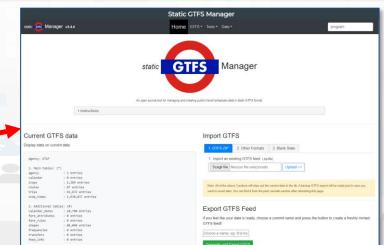
- Knowledge and Maps ▲
  - Service Map (Toscana)
  - Service Map 3D (Firenze)
  - Helsinki Service Map
  - Antwerp Service Map
  - Garda Lake Service Map
  - Cagliari Service Map
  - Lonato Del Garda Service Map
  - Valencia Service Map
  - Pont Du Gard Service Map
  - Dubrovnik Service Map
  - WestGreece Service Map
  - Mostar-Bosnia Service Map
  - Svealand Service Map
  - Roma Service Map
  - Pisa Service Map
  - Creating WKT
  - Service Map 3D (Antwerp)
  - Service Map 3D (Helsinki)
  - Producing POI triples for KB
  - Load WKT on ServiceMap (Helsinki)
  - Load WKT on ServiceMap (Toscana)
  - Load WKT on ServiceMap (Antwerp)
  - My Annotation on Services/Data
  - Mapping Services Data
  - ArcGIS DISIT Service
  - Static GTFS Manager

- A number of ServiceMaps, Knowledge bases, KB
- Tools for creating WKT, shapes
- Access to ServiceMap 3D, if any
- Service for Loading triples on KB
- My Annotations (deprecated)
- Mapping Tool (partial)
- GIS servers, if any
- Static GTFS editor and manager (if any)

Producing POI triples for KB

This page is a service for generating triples from CSV files of POI

please upload a CSV file according to the instructions of page https://www.snap4city.org/589 :

you are going to receive an email with a file to be loaded in your KB:

email:
ITA: it
Scegli file Nessun file selezionato   Submit

Mapping Services Data

Source:ServiceURI	Destination:ServiceURI	id	Actions
mangalore View	bangalore View	20	EDIT DEL
http://www.disit.org/km4city/resource/CarParkS.Lorenzo View	http://www.disit.org/km4city/resource/CarParkBeccaria View	19	EDIT DEL
http://www.disit.org/km4city/resource/a9ac455916a724b61e5a8dcd228f7fcd View	http://www.disit.org/km4city/resource/CarParkParterre View	18	EDIT DEL
http://www.disit.org/km4city/resource/CarParkCareggi View	http://www.disit.org/km4city/resource/CarParkPieracciniMeyer View	11	EDIT DEL

Showing 1 to 4 of 4 entries

Static GTFS Manager

static GTFS Manager

An open source tool for managing and creating public transit schedules data in static GTFS format

Current GTFS data
Display stats on current data

Import GTFS

Export GTFS Feed

IOT Applications

- **IOT Applications**: a view to manage Containers / IOT Edge Apps: IOT Apps, Data Analytics (R and Python), WebScraping, IOT edge, etc.

Managing also

- **MicroServices for IOT App exploiting REST Call**

- **MicroServices from DataAnalytics**

For non admin tools see Training parts 3 and 5: https://www.snap4city.org/577
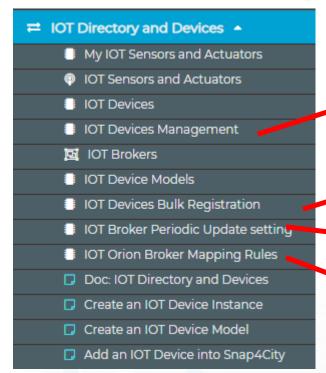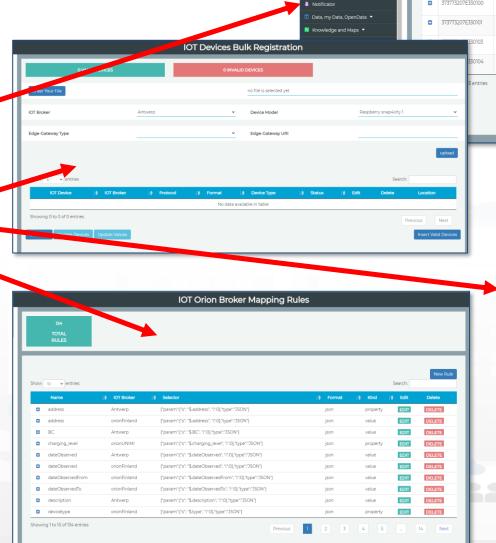
IOT Directory and Devices

- For non admin tools see Training parts 3 and 5: https://www.snap4city.org/577

Resource Manager
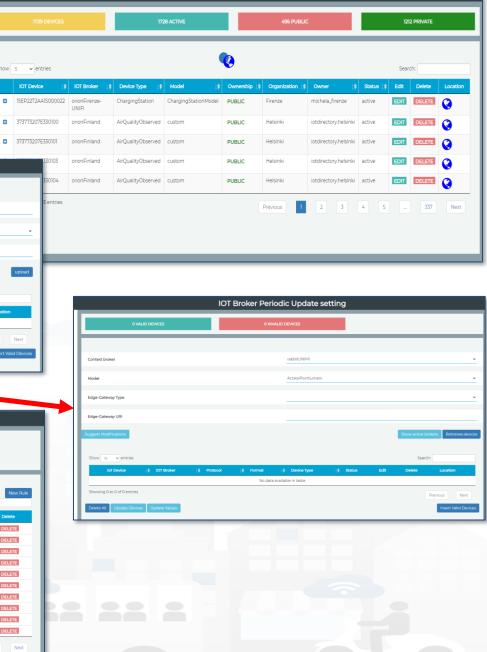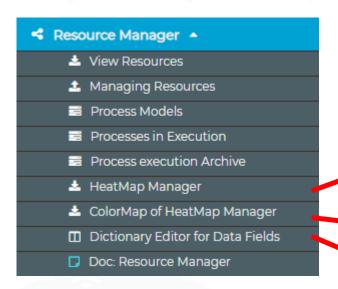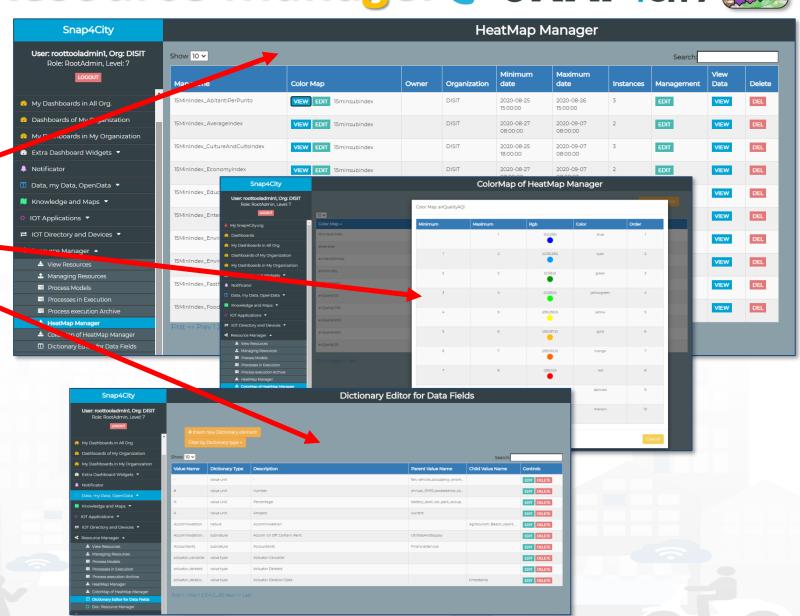
- Tools for managing shared resources among Organizations and Users

- For non admin tools see Training parts: https://www.snap4city.org/577

Development Tools

Development Tools ▲
- Web Scraping Tool
- Jupyter Hub - Python
- Web Scraping Tool (0n)
- Web Scraping Tool (6l)
- R Studio Development
- R Studio Development 0.11
- R Studio Development 0.116
- R Studio Development TF
- R Studio Development GFF
- R Studio Development Gral
- ETL Development
- ETL Development 1
- ETL Development 2
- Knowledge Base Graphs
- Knowledge Base Queries
- Smart City API Docs: Swagger
- Internal API Docs: Swagger
- Testing API by Postman
- Source Code Access
- How to Develop Smart Applications

- *All these tools are well described into Training parts:* https://www.snap4city.org/577

- *The Administrators may*
  - *access to all instances of them*
  - *Grant access to them at specific AreaManager users*

- WebScraping tool

- Python online dev. Environment

- R Studio Online dev. Environment

- ETL OnLine dev. Environment

- Knowledge Base Graphs (LOG.disit.org)

- SPARQL Editor and tools (custom FLINT)

Decision Support Systems

Decision Support Systems ▲

- Smart City Control Room
- Workflow Management Ticketing
- Altair Maintenance
- Workflow Management, Ticketing
- DORAM Public Transport Analyzer
- Doc: DORAM Pub Transp. Analyzer
- Twitter Vigilance
- Twitter Vigilance Real Time
- Twitter Vigilance Antwerp
- Twitter Vigilance Helsinki
- Twitter Vigilance WestGreece
- Twitter Vigilance Valencia
- Twitter Vigilance Firenze HeritData
- Twitter Vigilance Pont Du Gard
- Twitter Vigilance Dubrovnik
- Twitter Vigilance Notes
- What-If Analysis
- Doc: What-If Analysis
- Origing Destination Matrices
- Traffic Flow Reconstruction
- High Res. Pollutant Predictions
- Resilience Decision Support Sys
- Smart Decision Support Sys
- Doc: Smart & Resilience DSS

- All these tools are well described into Training parts: https://www.snap4city.org/577

- Some of these tools need special VM / appliances, services to be activated

- Most of them are accessible to the public at least with guest account

- The Administrators may
  - access to all instances of them
  - Grant access to them at specific AreaManager users

Settings

- **Menu Management**: for managing main menu and submenu, on web and mobile, and those of the Organizations on Dashboards

- A number of configurations for the Dashboard Manager (most of them are valid only for OnPremise solutions, and/or V1 infrastructure approach)

User Management

User Management and Auditing

User Management and Auditing ▲

- User Management
- User Limits Management
- User Engagement
- User Engagement Dash
- User Role Management via LDAP
- Manage Resource Ownership
- User Chats Management
- Auditing Data Access Try-out
- Auditing Elements vs Ownership
- Auditing Personal Data
- Auditing Accesses Authetication
- Auditing User Activities
- Auditing Activities on Queries
- Auditing Activities on Articles
- Auditing IOT Directory Data
- Dashboard Builder Local Users
- Organizations vs Groups
- Users vs Organizations

- All that the RootAdmin needs to manage:
  - **User Management: for managing**
    - accounts and profiles
    - limits of the users in exploiting resources
    - Accesses and providing special authorization
    - Organization vs Groups of users
    - Users vs Organizations
  - **Users vs Web and Mobile Applications**
    - Engaging and monitoring users on platform and devices
  - **Users on Chats room of Dashboards**
    - Managing Users on Chats of Dashboards
  - **Auditing of the data and resource accesses**
    - Auditing all the activities on the platform (see next section)
    - Personal auditing

User Management

- User Management via Drupal or Local Users Management without CRM.

- User Limits con controlling resource consumption

- User Engagement: see mobile App training part

- Roles and LDAP management

- Managing Resources vs Users' Ownerships and granted accesses to the resources

- Organizations and their Groups of users

- Users vs Organizations

- ..

- AND User Access Authentication via KeyCloak
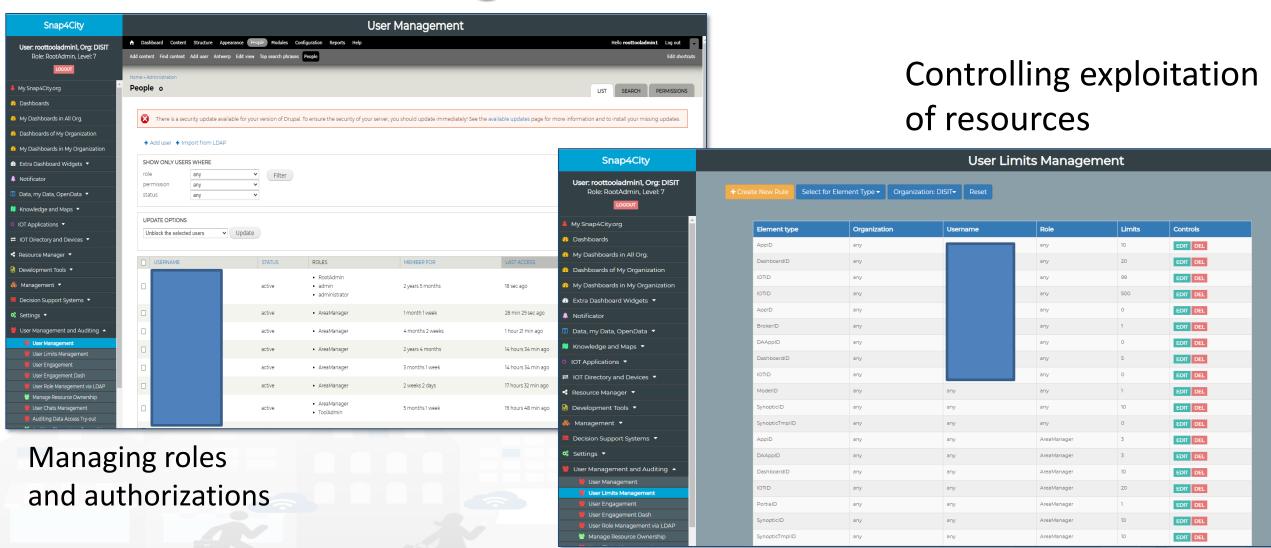
User Management and Users' Limits

Controlling exploitation of resources

Managing roles and authorizations
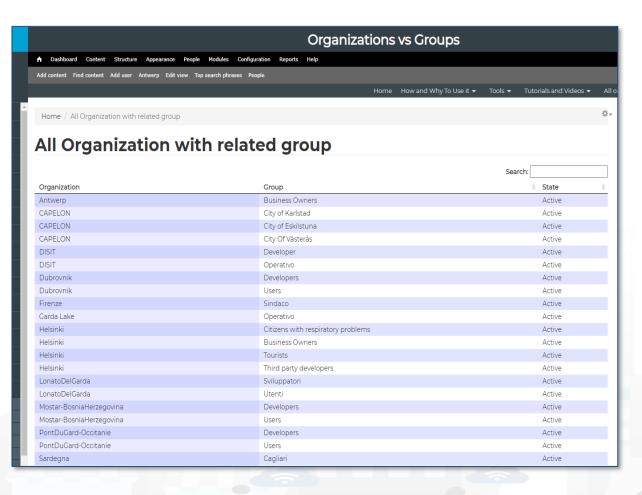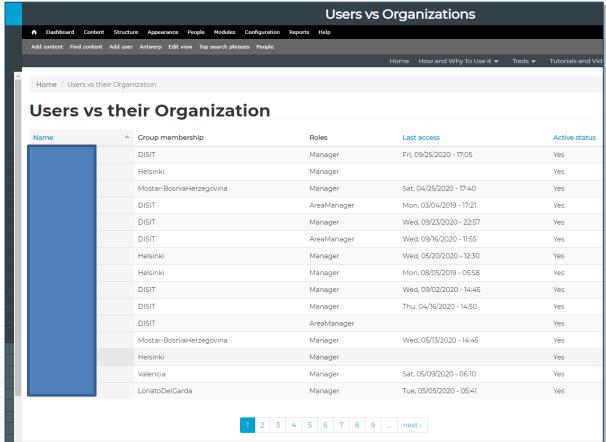
Organizations vs Groups vs Users

Auditing Activities

- 👥 Auditing Data Access Try-out
- 👥 Auditing Elements vs Ownership
- 👥 Auditing Personal Data
- 👥 Auditing Accesses Authetication
- 👥 Auditing User Activities
- 👥 Auditing Activities on Queries
- 👥 Auditing Activities on Articles
- 👥 Auditing IOT Directory Data

Auditing Activities

Management

Management navigation menu:

- Traffic Analyzer: AMMA
- Data Analyzer: DevDash
- Data Analyzer: DevDash Firenze
- Data Analyzer: DevDash Helsinki
- Data Analyzer: DevDash DISIT
- Data Analyzer: DevDash Lonato
- Data Analyzer: whole traffic
- Container Cluster Monitoring
- Back Office Container Monitoring
- IOT App Version Management
- Smart City API Monitoring
- MyKPI Monitoring
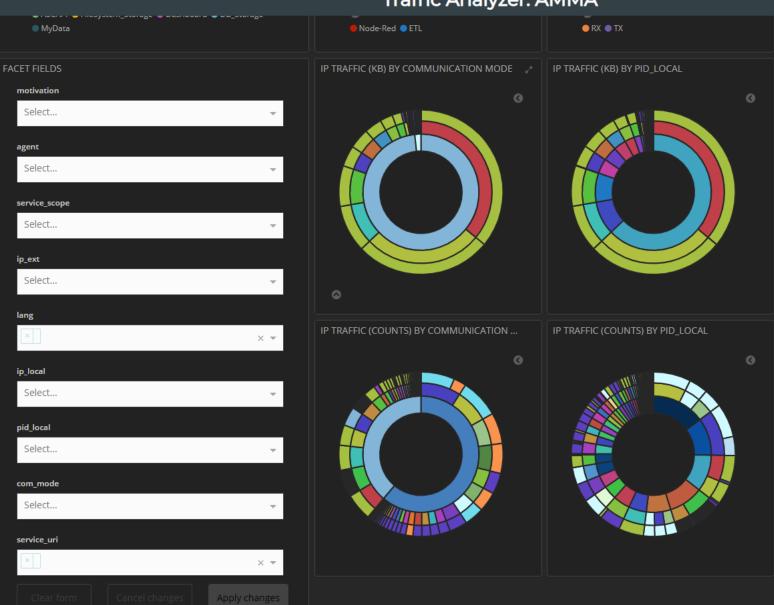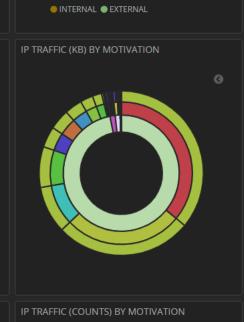- Notificator Monitoring
- Web Server Monitoring
- Back Office DWH Sched DISCES
- Back Office DA Sched DISCES
- Back Office DISCES monitor
- Mobile Application Monitoring
- Mng Anonym. Photos Comments
- Mng Photos Comments HelAnt
- Mng Online Helps
- Config ResDash
- Mesos view
- DISCES-EM
- DISCES-EM tail
- IOT App for Conf Clust Monitor

- **Tools for Platform Management.**
  - Most of them only accessible for RootAdmin and OnPremise
- Tools can be **grouped in the following families**
  - AMMA Traffic Analyzer (Elastic Search, Kibana)
  - DataAnalyzer (DevDash): monitoring and browsing data ingested into Elastic Search, via Kibana
  - Container Monitoring and Management
  - IOT App Version Management of Snap4City tools
  - Smart City API traffic monitoring
  - MyKPI Monitoring
  - DISCES schedulers monitoring and management (V1 infrastructure versions)
  - Mobile Applications Monitoring
  - Management of Images and Comments from Smart City API, Mobile and Web Apps
  - Management of OnLine Helps (not active)

AMMA Traffic Analyzer (Elastic Search, Kibana)
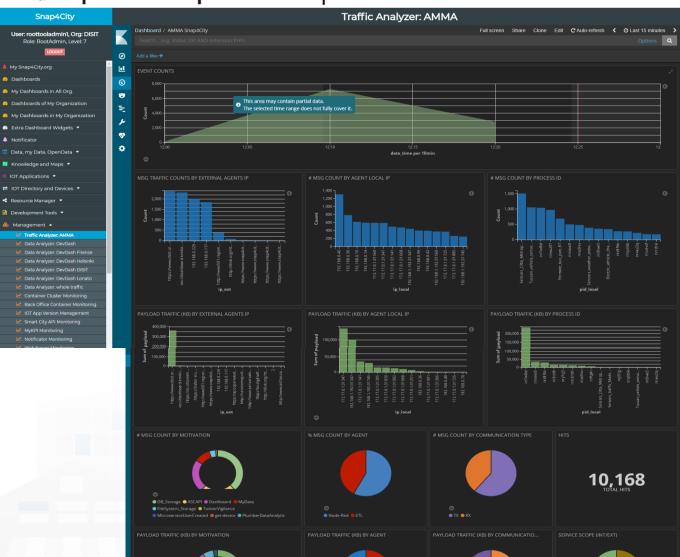
AMMA

- *Managing and Monitoring Data-Traffic in the BackOffice*
- Data Traffic Analyzer
  - Business intelligence
  - Faceted searches
  - Drill down on time
- Several different views and details on data traffic among the main entities in the platform:
  - IOT APP
  - Storage
  - Data sources,
  - ....

Event Logger

- There are API for Event Logger, REST API
  - They are automatically used by most of the Snap4City MicroServices
  - They log in standard Rsyslog API
    - https://www.snap4city.org/56

- The Logs regarding messages passed and usage are logged and accessed with the AMMA tools that is based on Elastic Search and Kibana.
  - Former version was made in Hbase and SOLR, and Banana

- Additional Logs events can be logged by using a dedicated MicroService in Node-RED, IOT Apps

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

LOGOUT

- Micro Applications
- External Services ▾
- Data Set Manager: Data Gate
- Resource Manager: Process Loader ▾
- Development Tools ▾
- Management ▴
  - Traffic Analyzer: AMMA
  - Data Analyzer: DevDash
  - Container Cluster Monitoring
  - Back Office Container Monitoring
  - Smart City API Monitoring
  - MyKPI Monitoring
  - Notificator Monitoring
  - Web Server Monitoring
  - Back Office DWH Sched DISCES
  - Back Office DA Sched DISCES
  - Back Office DISCES monitor
  - Mobile Application Monitoring
  - Mng Anonymous Photos Comments
  - Mng Photos Comments HelAnt
  - Mng Online Helps
  - Config ResDash
  - Mesos view
  - DISCES-EM
  - DISCES-EM tail
  - IOT App for Conf Clust Monitor
  - Smart Decision Support Sys
  - Resilience Decision Support Sys
  - DataGate Harvester
- Settings ▾
- User Management and Auditing ▾
- Help and Contacts ▾
- Documentation and Articles ▾
- My Profile ▾
- Km4City portal
- DISIT Lab portal

MSG COUNT BY MOTIVATION

- DB_Storage ● ASCAPI ● Dashboard ● FileSystem_Storage ● MyData
- PlumberDataAnalytic ● MicroserviceUserCreated

% MSG COUNT BY AGENT

- ETL ● Node-Red

MSG COUNT BY COMMUNICATION TYPE

- TX ● RX

HITS

1,922,214
TOTAL HITS

PAYLOAD TRAFFIC (KB) BY MOTIVATION

- ASCAPI ● FileSystem_Storage ● Dashboard ● DB_Storage ● MyData

PAYLOAD TRAFFIC (KB) BY AGENT

- Node-Red ● ETL

PAYLOAD TRAFFIC (KB) BY COMMUNICATION TYPE

- RX ● TX

SERVICE SCOPE (INT/EXT)

- INTERNAL ● EXTERNAL

FACET FIELDS

motivation

Select...

agent

Select...

service_scope

Select...

ip_ext

Select...

lang

ip_local

Select...

IP TRAFFIC (KB) BY COMMUNICATION MODE

IP TRAFFIC (KB) BY PID_LOCAL

IP TRAFFIC (KB) BY MOTIVATION

IP TRAFFIC (COUNTS) BY COMMUNICATION MODE

IP TRAFFIC (COUNTS) BY PID_LOCAL

IP TRAFFIC (COUNTS) BY MOTIVATION

Snap4City

- My Snap4City.org
- Dashboards
- My Dashboards in All Org.
- Dashboards of My Organization
- My Dashboards in My Organization
- Extra Dashboard Widgets ▾
- Notificator
- Data, my Data, OpenData ▾
- Knowledge and Maps ▾
- IOT Applications ▾
- IOT Directory and Devices ▾
- Resource Manager ▾
- Development Tools ▾
- Management ▴
  - Traffic Analyzer: AMMA
  - Data Analyzer: DevDash
  - Data Analyzer: DevDash Firenze
  - Data Analyzer: DevDash Helsinki
  - Data Analyzer: DevDash DISIT
  - Data Analyzer: DevDash Lonato
  - Data Analyzer: whole traffic
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  - Back Office Container Monitoring
  - IOT App Version Management
  - Smart City API Monitoring
  - MyKPI Monitoring
  - Notificator Monitoring
  - Web Server Monitoring

FABAPI Filesystem_storage Dashboard DB_storage
MyData

Node-Red ETL

RX TX

INTERNAL EXTERNAL

FACET FIELDS

motivation

Select...

agent

Select...

service_scope

Select...

ip_ext

Select...

lang

×

ip_local

Select...

pid_local

Select...

com_mode

Select...

service_uri

×

Clear form   Cancel changes   Apply changes

IP TRAFFIC (KB) BY COMMUNICATION MODE

IP TRAFFIC (KB) BY PID_LOCAL

IP TRAFFIC (KB) BY MOTIVATION

IP TRAFFIC (COUNTS) BY COMMUNICATION ...

IP TRAFFIC (COUNTS) BY PID_LOCAL

IP TRAFFIC (COUNTS) BY MOTIVATION

OD matrix

Traffic Analyzer: AMMA

AMMA (1)

Monitor data traffic flows among IoT devices, services, applications etc. and detect potential anomalies

quantitatively monitoring data/message traffic and flows

Unexpected behaviors can be revealed by inspecting the data flow time trend:

a) detecting peaks or valleys in the trend

b) drill-down on data to identify single/more malfunctioning devices and/or services
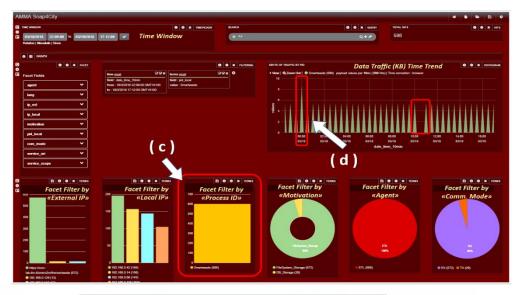
AMMA (2)

Make drill-down activities on data related to a single Process ID and check for unexpected behavior in the Time Trend panel:

c) Filtering data by the Process ID (e.g. for example those related to a SmartWaste container)

d) Detect a peak with more data traffic than expected during its scheduled activity, by properly filtering on time, the single data portion corresponding to the unexpected data flow can be viewed

e) Locate on map the single involved device or service
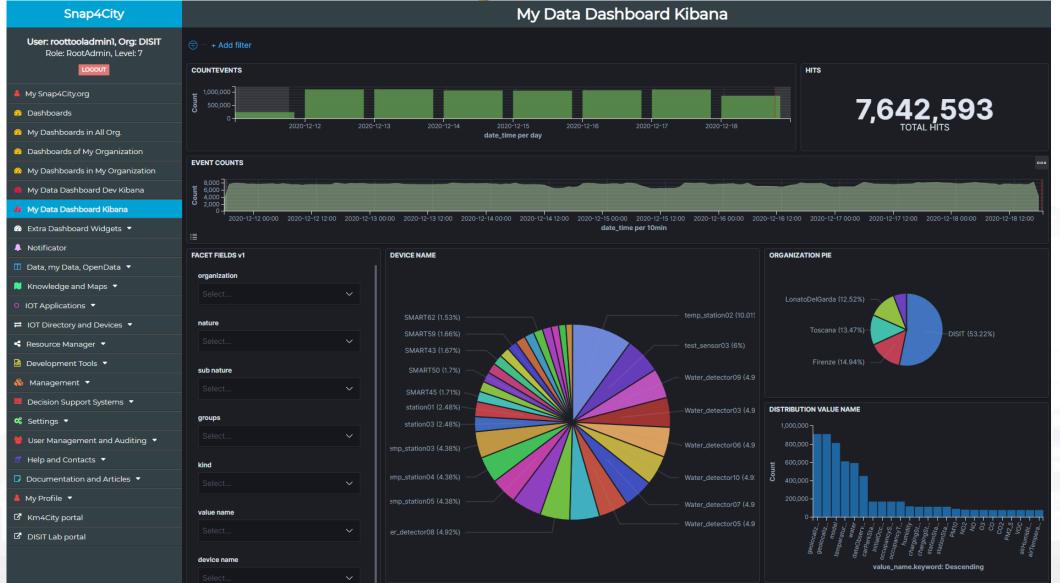
DevDash: My Data Dashboard Kibana

Business Analysis Dashboards For all kind of users: DevDash

- Dynamic Filtering, Adaptable, …
- Full data details, drill down,…
- Synergic with **Data Inspector** which addresses data relationships, processing and information
- **Only Your Data for**
  - Manager and Area Managers
- **All Accessible Data for**
  - ToolAdmin and RootAdmin

- Multi faceted Search by
  - Devices
  - Organization
  - Drill on Time
  - Drill on Map
  - Value Types
  - Data Type
  - Value name
  - Data table
  - Etc.

- Respect Privacy and GDPR

294

Snap4City

- My Snap4City.org
- Dashboards
- My Dashboards in All Org.
- Dashboards of My Organization
- My Dashboards in My Organization
- Extra Dashboard Widgets ▾
- Notificator
- Data, my Data, OpenData ▾
- Knowledge and Maps ▾
- IOT Applications ▾
- IOT Directory and Devices
- Resource Manager ▾
- Development Tools ▾
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  - Data Analyzer: DevDash Firenze
  - Data Analyzer: DevDash Helsinki
  - Data Analyzer: DevDash DISIT
  - Data Analyzer: DevDash Lonato
  - Data Analyzer: whole traffic
  - Container Cluster Monitoring
  - Back Office Container Monitoring
  - IOT App Version Management
  - Smart City API Monitoring
  - MyKPI Monitoring
  - Notificator Monitoring
  - Web Server Monitoring
  - Back Office DWH Sched DISCES
  - Back Office DA Sched DISCES
  - Back Office DISCES monitor
  - Mobile Application Monitoring

Data Analyzer: DevDash

SMARTCITYMAP

Number of Sensors 4
Latitude 43.77896531461738
Longitude 11.2758450344471

Number of Sensors
- 1 – 4.333
- 4.333 – 7.667
- 7.667 – 11

© OpenStreetMap contributors , Elastic Maps Service

EVENTS

1–50 of 176,794

| Time ▾	organization	deviceName	value	src	kind	latlon	value_name	value_type	data_type	serviceUri	value_unit	value_str
October 11th 2020, 12:33:52.790		test_sensor03	9.215	IOT	sensor	43.7921,11.2495	geolocalization_lon	longitude	float	http://www.disit.org/km4city/resource/iot/orionUNIFI/test_sensor03	#	-
October 11th 2020, 12:33:52.790		test_sensor03	24	IOT	sensor	43.7921,11.2495	temperature	temperature	float	http://www.disit.org/km4city/resource/iot/orionUNIFI/test_sensor03	°C	-
October 11th 2020, 12:33:52.790		test_sensor03	-	IOT	sensor	43.7921,11.2495	geolocalization_lat	latitude	float	http://www.disit.org/km4city/resource/iot/orionUNIFI/test_sensor03	#	NaN
October 11th 2020, 12:33:52.492	DISIT	testxxx3	1,602,412,480,000	IOT	sensor	43.79737,11.3063	timestamp	timestamp	timestamp	http://www.disit.org/km4city/reso	#	-
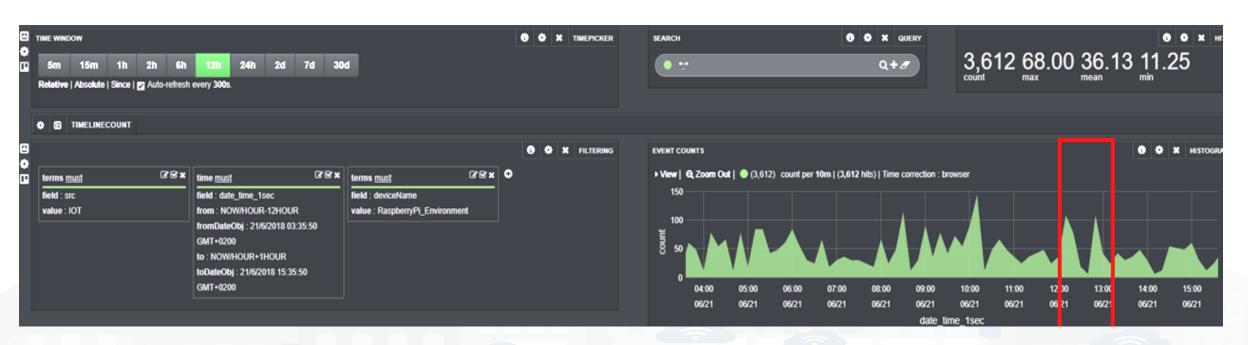
DevDash Case Study (2)

- Detect potential anomalies or disfunctions by inspecting the DevDash tool time trend
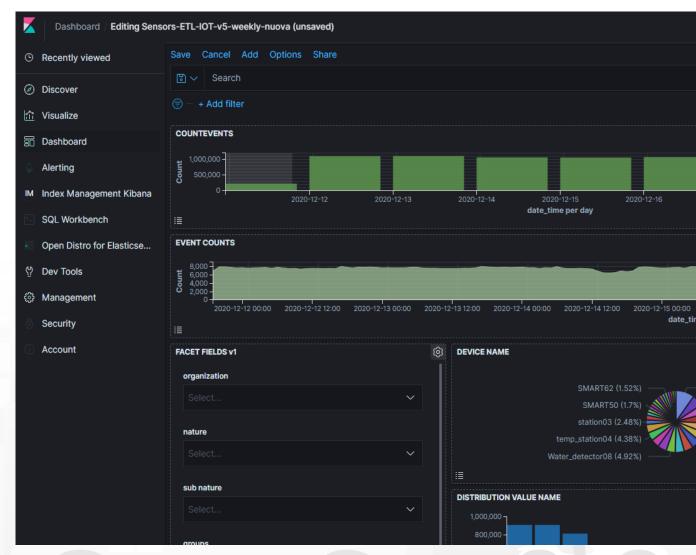
My Data Dashboard Customization

- My Data Dashboards (for Developers and for Managers) can be customized by RootAdmin.

  – Authority for Customizzation can be also extended to other role on Premise solutions

- Customizations is based on Full editing Capabilities of Kibana Elastic Search 7, and with multiple indexes of Snap4City

Back office Platform Scalability
Containers Management and Monitoring

- Container Cluster Monitoring
- Back Office Container Monitoring
- Mesos view
- DISCES-EM
- DISCES-EM tail

Managing Back Office Processes on Containers
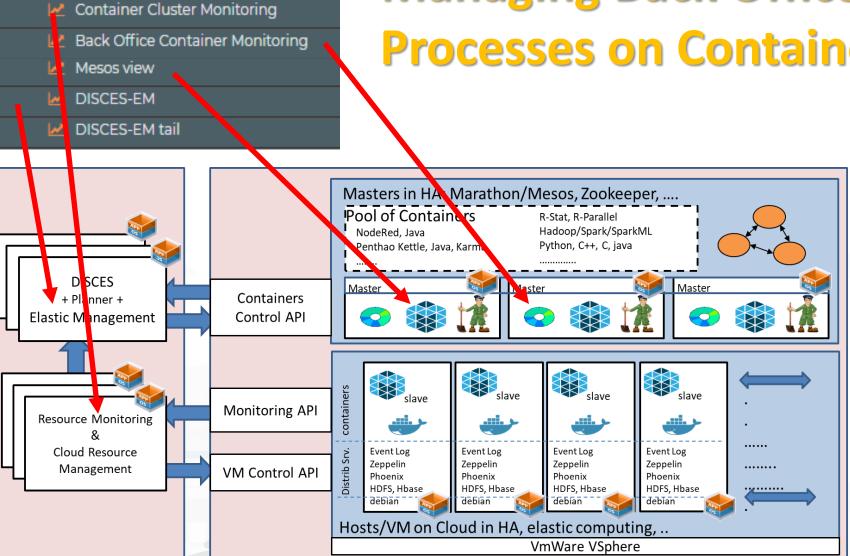
- Containers:
  - IOT App,
  - Web Crawling,
  - (ETL processes),
  - Data Analyics in R Studio,
  - Data Analytics in Python

- Elastic management
- Management via
  - Marathon
  - Mesos
  - DISCES EM
- Possible on Kubernetes

Elastic Scaling: allocating / deallocating

- Allocation/ deallocation, Rebalancing vs compacting
  - Vertical of resources: Docker and/or VM: CPU, Mem
    - NodeJS multi-flow for each Docker, the user request data flows and IOT App, Snap4City allocates them dynamically on demand and perform workload optimization
    - VM: management of Mem, CPU; transparent and automatic in DRS VMware
  - Horizontal of resources of Dockers and/or VM and/or [Host]:
    - Docker: addition of containers, migrations/moving, balancing (per moving) of IOT App
    - VM: on/off
- Monitoring resources:
  - VM via VMware API,   Docker via Marathon and Mesos APIs
- Algorithm in Python for scaling, actions via APIs: VMware, Marathon,..
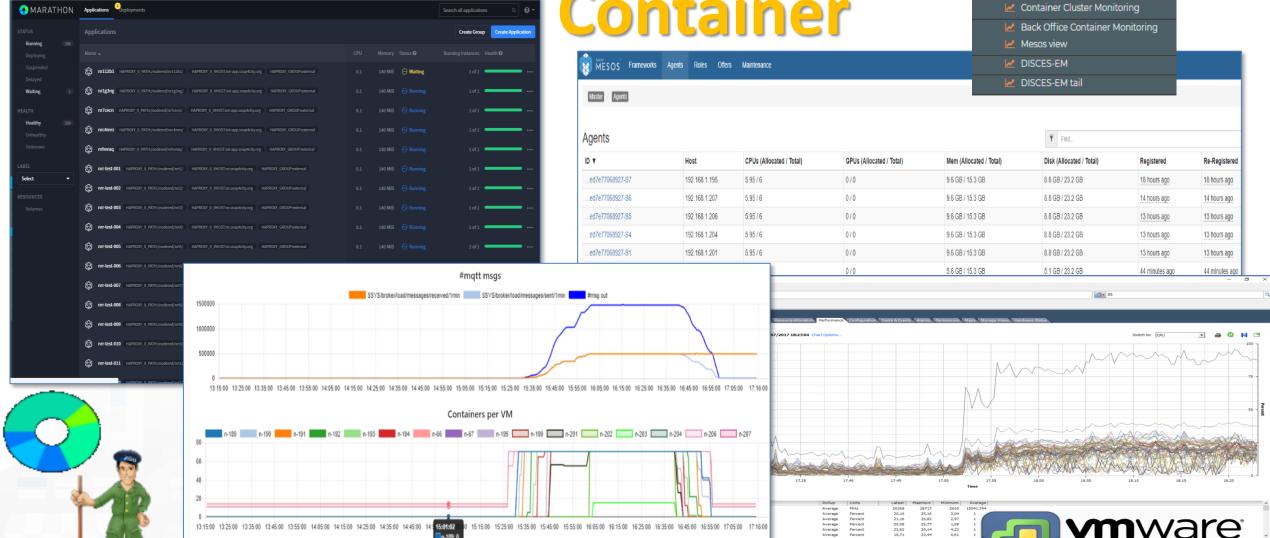
Container

Snap4City

panesi
ToolAdmin | ldap
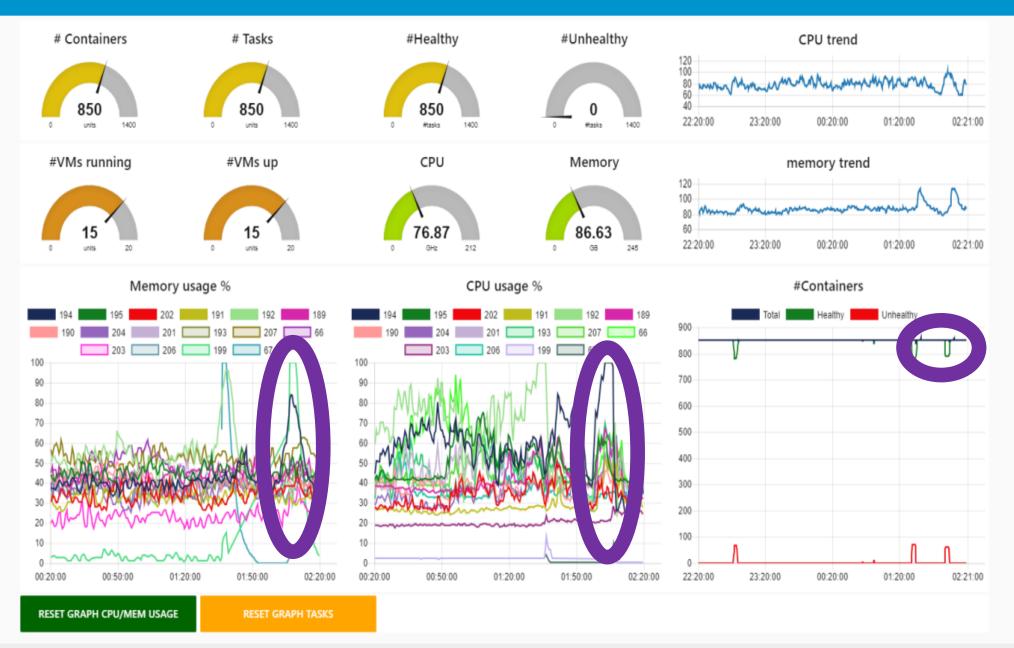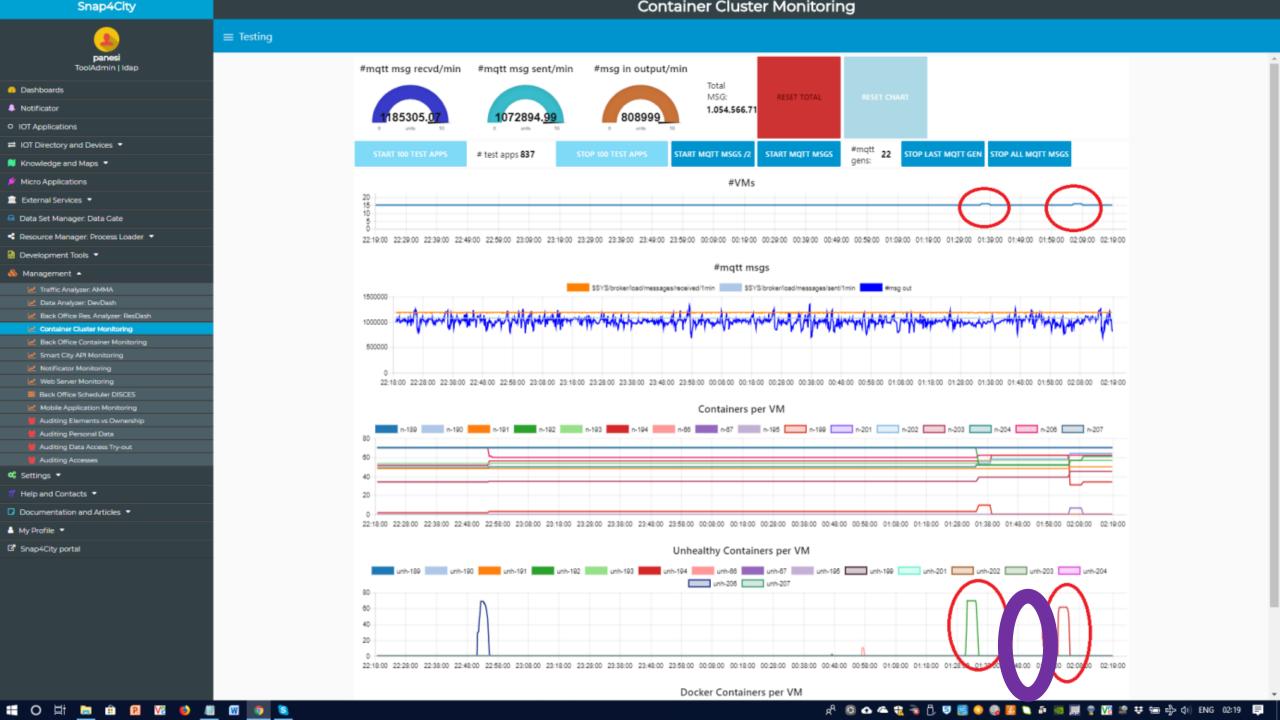
- Dashboards
- Notificator
- IOT Applications
- IOT Directory and Devices ▾
- Knowledge and Maps ▾
- Micro Applications
- External Services ▾
- Data Set Manager: Data Gate
- Resource Manager: Process Loader ▾
- Development Tools ▾
- Management ▴
  - Traffic Analyzer: AMMA
  - Data Analyzer: DevDash
  - Back Office Res. Analyzer: ResDash
  - **Container Cluster Monitoring**
  - Back Office Container Monitoring
  - Smart City API Monitoring
  - Notificator Monitoring
  - Web Server Monitoring
  - Back Office Scheduler DISCES
  - Mobile Application Monitoring
  - Auditing Elements vs Ownership
  - Auditing Personal Data
  - Auditing Data Access Try-out
  - Auditing Accesses
- Settings ▾
- Help and Contacts ▾
- Documentation and Articles ▾
- My Profile ▾
- Snap4City portal

Testing

#mqtt msg recvd/min: 1185305.07

#mqtt msg sent/min: 1072894.99

#msg in output/min: 808999

Total MSG: 1.054.566.71

RESET TOTAL

RESET CHART

START 100 TEST APPS | # test apps 837 | STOP 100 TEST APPS | START MQTT MSGS /2 | START MQTT MSGS | #mqtt gens: 22 | STOP LAST MQTT GEN | STOP ALL MQTT MSGS

#VMs

#mqtt msgs

$SYS/broker/load/messages/received/1min
$SYS/broker/load/messages/sent/1min
#msg out

Containers per VM

n-189, n-190, n-191, n-192, n-193, n-194, n-66, n-67, n-195, n-199, n-201, n-202, n-203, n-204, n-206, n-207

Unhealthy Containers per VM

unh-189, unh-190, unh-191, unh-192, unh-193, unh-194, unh-66, unh-67, unh-195, unh-199, unh-201, unh-202, unh-203, unh-204, unh-206, unh-207

Docker Containers per VM

Computational Capabilities of Snap4City
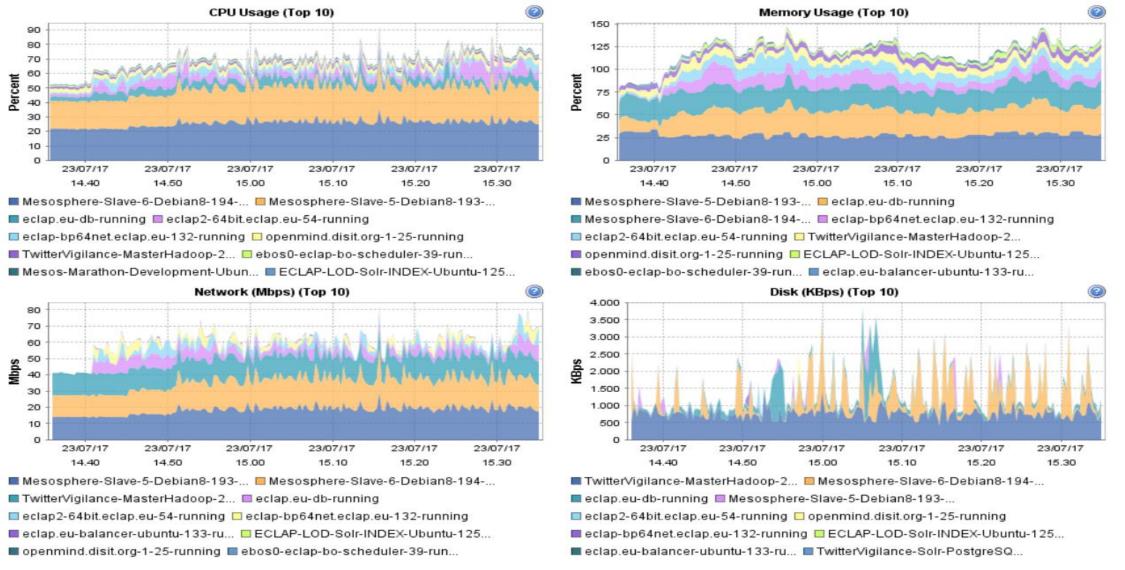
- **Managing:**
  - **Periodic Processes** → ETL, IOT App (Node-RED)
  - **Asynchronous processes**, data driven, real time → Node-RED, IOT Applications

- **Scalability**
  - **Horizontal**: Increasing processes performing activities, demand on new processes for new users, for new applications, for new IOT applications: VM, Hosts, clusters, Storage SAN
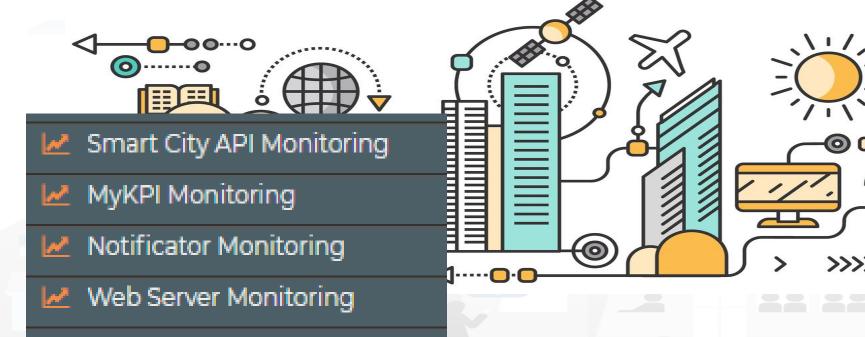 - **Vertical**: Increasing resources on processes: CPU, MEM, Storage, Network

Monitoring on Cloud

Monitoring Resources and API Traffic

- Smart City API Monitoring
- MyKPI Monitoring
- Notificator Monitoring
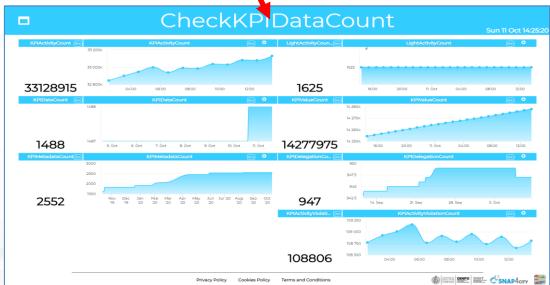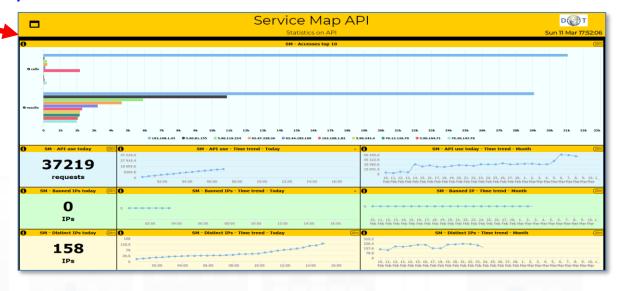- Web Server Monitoring
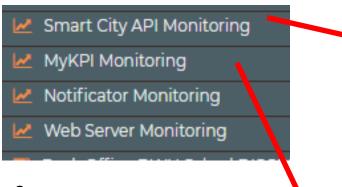
Monitoring Smart City API Usage

http://www.disit.org/dashboardSmartCity/view/index.php?iddasboard=MTkw

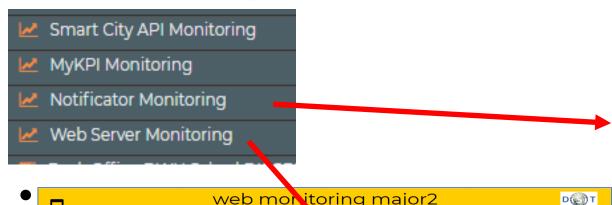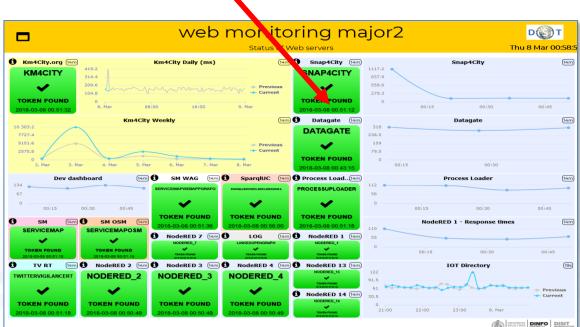https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTY0NA==

Monitoring Resources and Traffic

http://www.disit.org/dashboardSmartCity/view/index.php?iddasboard=MTQ4

http://www.disit.org/dashboardSmartCity/view/index.php?iddasboard=MjQ5

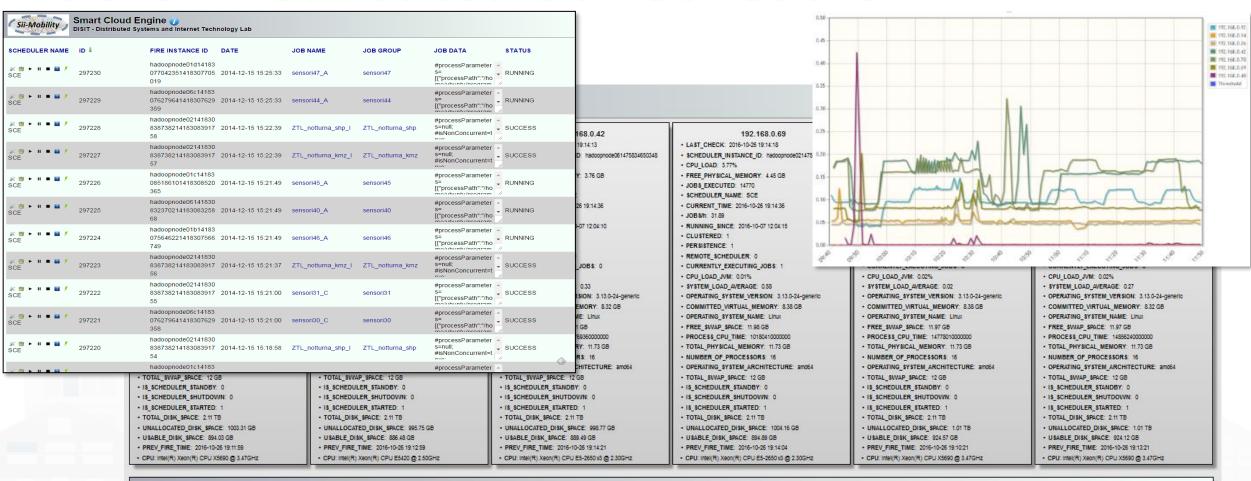# *Monitoring Schedulers via DISCES Processes and ==ETL tasks==*

In Yellow alternative & legacy solutions

- Back Office DWH Sched DISCES
- Back Office DA Sched DISCES
- Back Office DISCES monitor

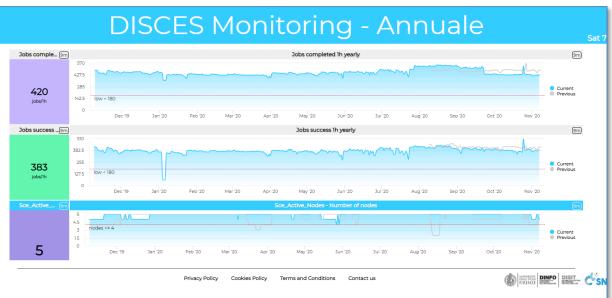# DISCES: Distributed SCE Scheduler

DISCES monitoring

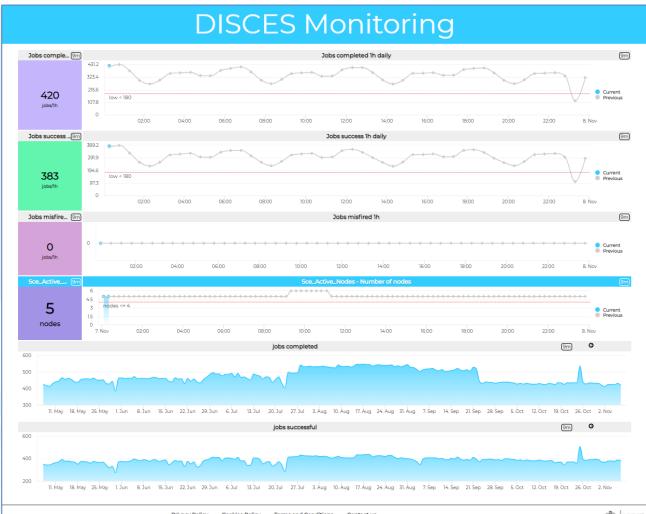https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjM5Mw==

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjE3Mw==

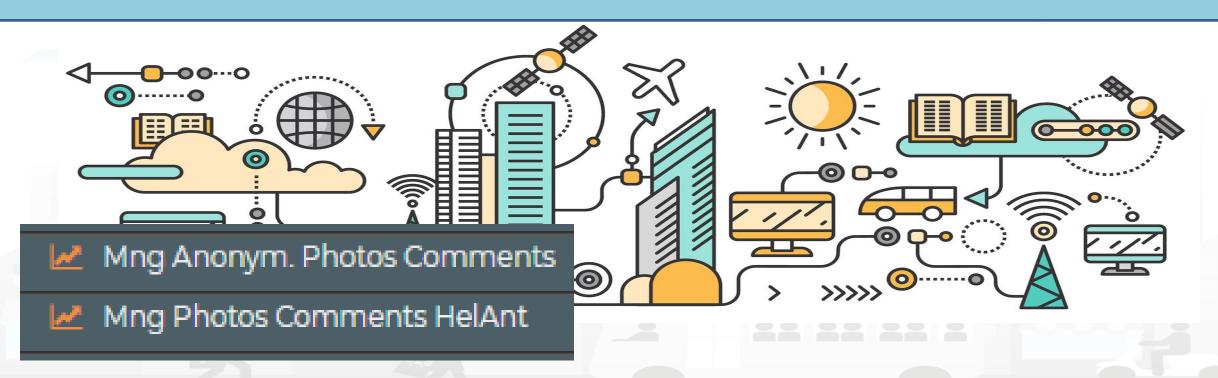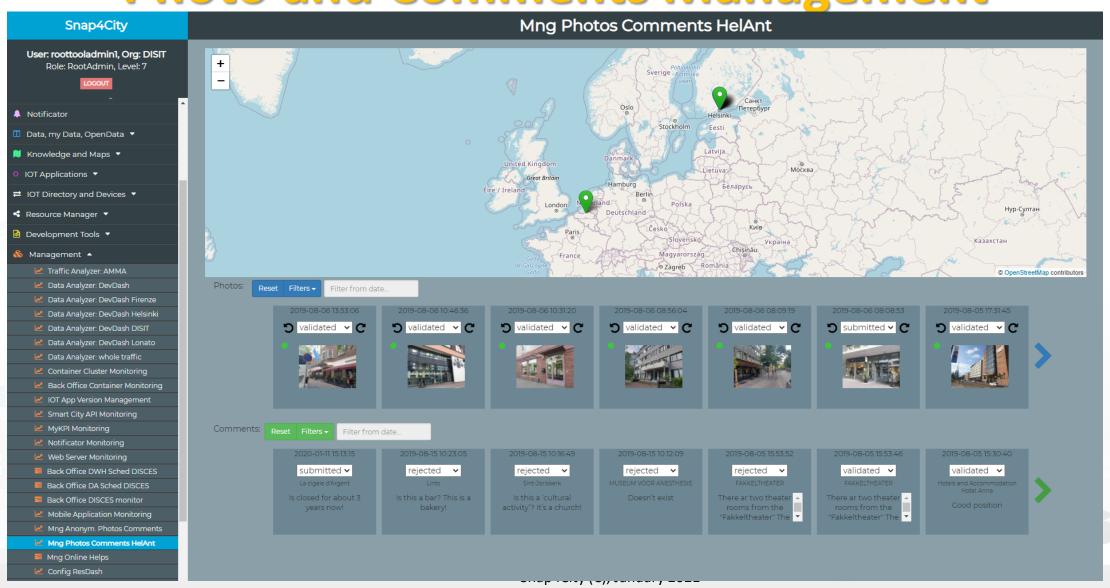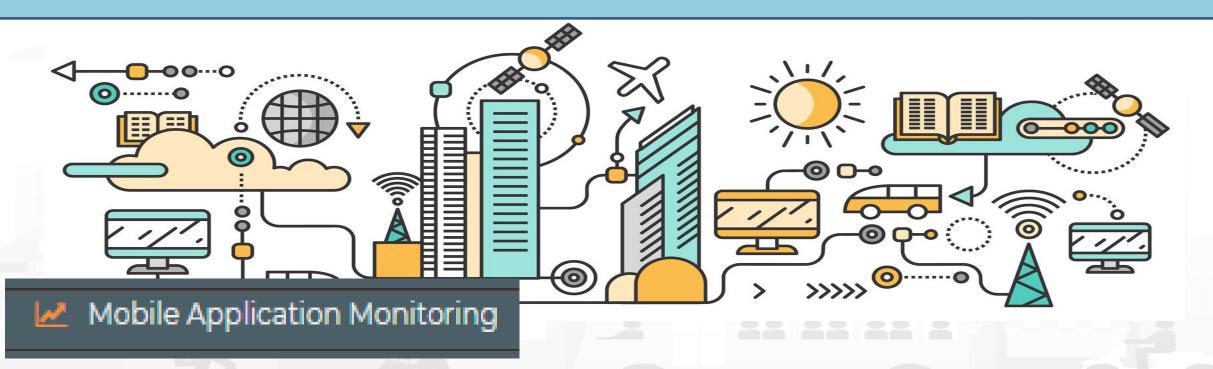# *Managing Photos and Comments from Web and Mobile Apps*

TOP

Mng Anonym. Photos Comments

Mng Photos Comments HelAnt

Snap4City (C), January 2021

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Photo and Comments Management

Mobile App Monitoring and Management

Mobile Application Monitoring

Mobile App Monitoring and Management

Mobile Application Monitoring

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

LOGOUT

- IOT Applications ▾
- ⇄ IOT Directory and Devices ▾
- ◂ Resource Manager ▾
- 🗐 Development Tools ▾
- ⚙ Management ▴
  - 📈 Traffic Analyzer: AMMA
  - 📈 Data Analyzer: DevDash
  - 📈 Data Analyzer: DevDash Firenze
  - 📈 Data Analyzer: DevDash Helsinki
  - 📈 Data Analyzer: DevDash DISIT
  - 📈 Data Analyzer: DevDash Lonato
  - 📈 Data Analyzer: whole traffic
  - 📈 Container Cluster Monitoring
  - 📈 Back Office Container Monitoring
  - 📈 IOT App Version Management
  - 📈 Smart City API Monitoring
  - 📈 MyKPI Monitoring
  - 📈 Notificator Monitoring
  - 📈 Web Server Monitoring
  - 🗐 Back Office DWH Sched DISCES
  - 🗐 Back Office DA Sched DISCES
  - 🗐 Back Office DISCES monitor
  - 📈 **Mobile Application Monitoring**
  - 📈 Mng Anonym. Photos Comments
  - 📈 Mng Photos Comments HelAnt
  - 🗐 Mng Online Helps
  - 📈 Config ResDash

City Users and Stats	Recommendations Log	General Settings	Social Media Group Recommendations Settings	Groups Recommendations Priorities
Class Scores	City Users	List of Trajectories Clusters	Heatmap and Trajectories Clusters (User Profile: All)	Heatmap and Trajectories Clusters (User Profile: Citizen)
Heatmap and Trajectories Clusters (User Profile: Commuter)	Heatmap and Trajectories Clusters (User Profile: Student)	Heatmap and Trajectories Clusters (User Profile: Tourist)	Heatmap and Trajectories Clusters (User Profile: Disabled)	Heatmap and Trajectories Clusters (User Profile: Operator)
Heatmap and Trajectories Clusters of City Users Together	Real Time City Users: positions and movements	General Stats	Statistics for City Users Types	Interactive People Flow Maps
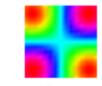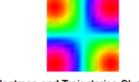
IOT Apps Version Management
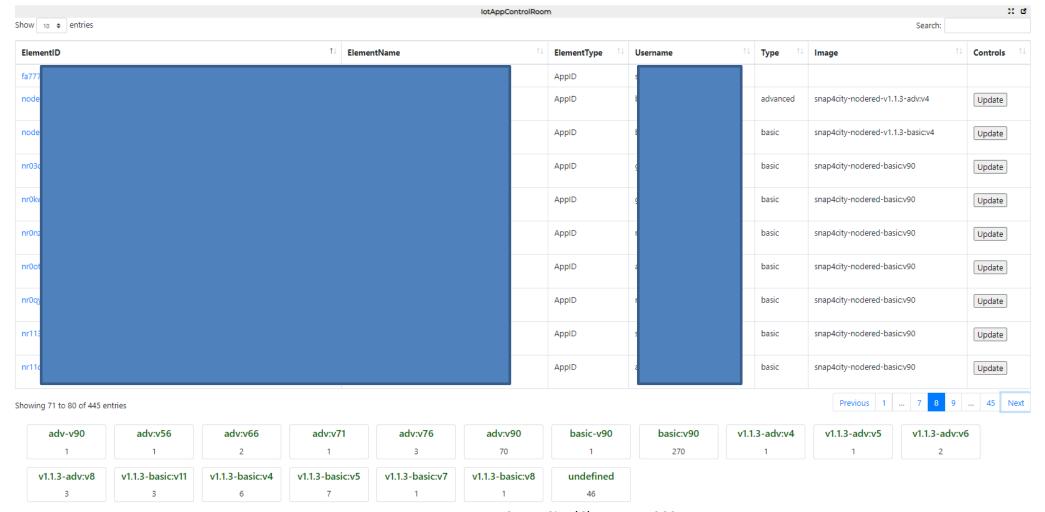
IOT App Versions Monitor and Upgrade

Snap4City (C), January 2021

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Customer Relationship Manager Integration and Living Lab basic

Living Lab vs DRUPAL

- On CRM as Drupal 7 we have
  - **User Management r**egistration and mailing
    - LDAP connection role management
    - KeyCloak Authentication (OpenID Connect)
    - Management of user profile
  - **Content management** for Organizations and Groups
    - Indexing of all content and search
    - Distribution of content and Video
    - Reports and views
    - Tracking and monitoring
  - **Open to full contributions and comments**
    - **Workflow, expandable as all the CRM**
  - Etc.

Data-City Small example
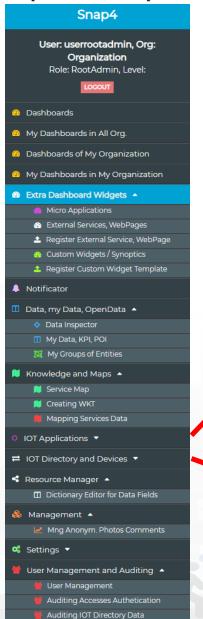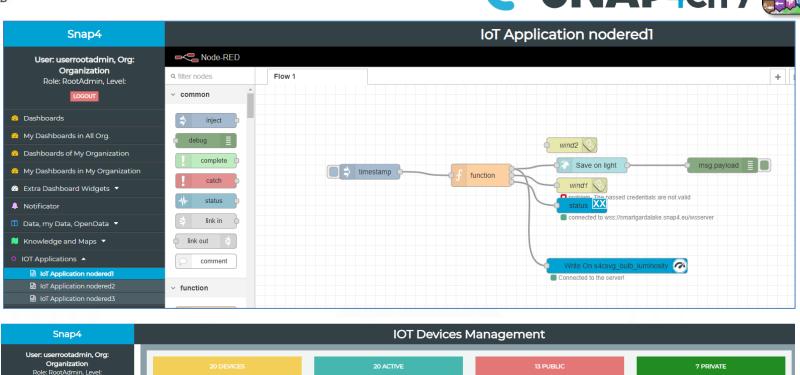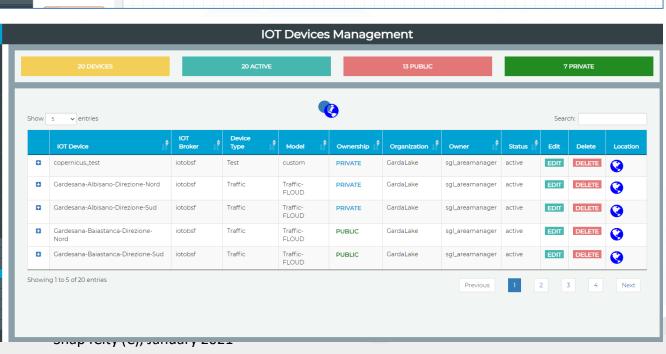
User Registration for DataCity-Small without Living Lab
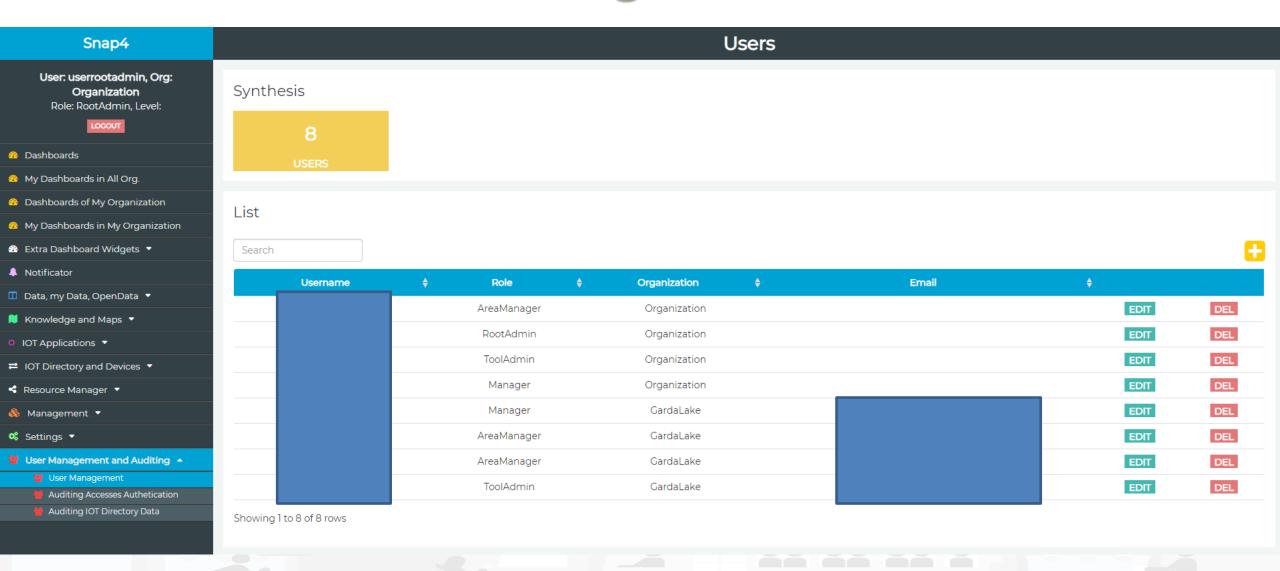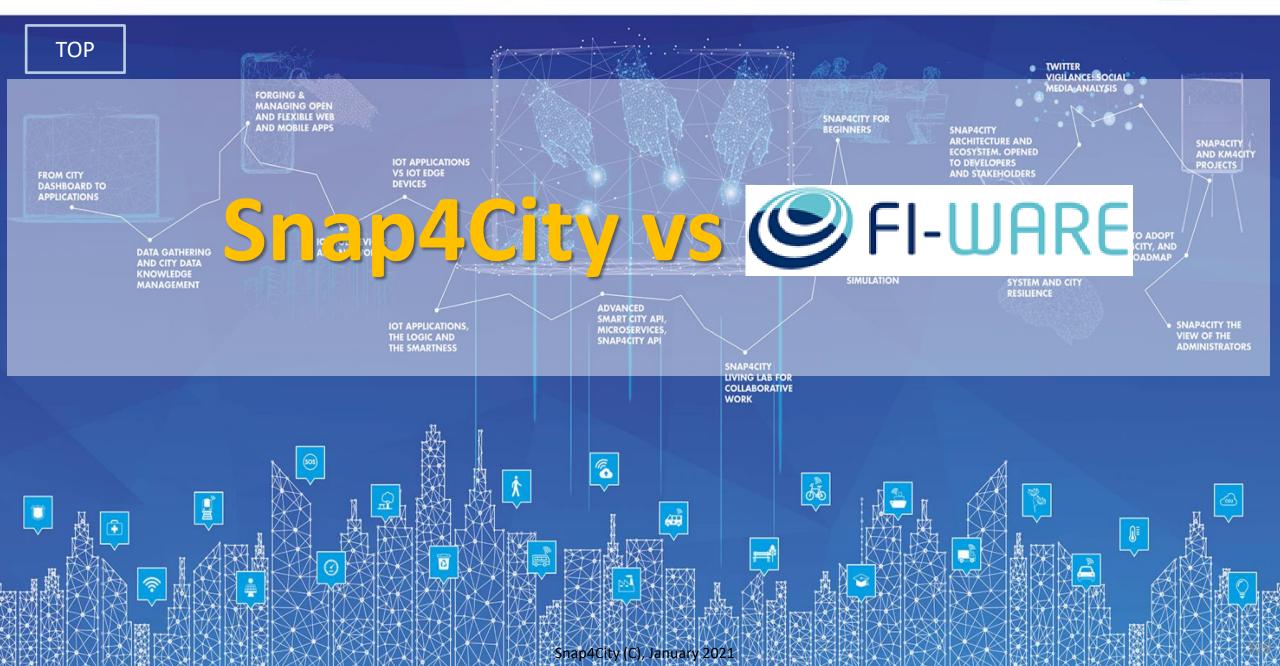
User registration

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES

TOP

Snap4City vs FI-WARE

THE FIWARE SMART CITIES REFERENCE ARCHITECTURE

Snap4City (C), January 2021

SNAP4CITY KM4CITY

URBAN PLATFORM: SMART CITY IOT AS A SERVICE AND ON PREMISE

100% OPEN SOURCE

APPLIANCES CONTAINERS

SMART CITY LIVING LAB

- LOCAL GOVERN
- STAKEHOLDERS
- CITY USERS
- IN-HOUSE
- ENERGY OPERATORS
- MOBILITY OPERATORS
- COMMERCIAL OPERATORS
- SECURITY OPERATORS
- INDUSTRIES
- RESEARCHERS
- START-UPS
- ASSOCIATIONS

- GDPR
- SECURITY
- PRIVACY
- ASSESSMENT
- AUDITING
- PENTESTED

- OPEN IOT DEVICES
- IOT EDGE
- IOT GATEWAY
- PAX COUNTERS
- IOT BUTTONS

- TEST CASES, SCENARIOUS, VIDEOS, HACKATHONS
- OPEN SOURCES, COMMUNITY OF CITIES
- TRAINING TUTORIALS, COMMUNITY MANAGEMENT

IOT APPLICATIONS - INSTANT APPS

DATA DRIVEN APPLICATIONS • REAL TIME PROCESSING • BATCH PROCESSING • ANY PROTOCOL & FORMAT

DASHBOARDS & APPLICATIONS

CONTROL ROOM • SITUATION ROOM • OPERATOR DASHBORDS • BUSINESS INTELLIGENCE • WHAT-IF ANALYSIS • DECISION SUPPORT • SIMULATIONS • RISK ANALYSIS • RESILIENCE ANALYSIS

MOBILE & WEB APPLICATIONS

DEVELOPMENT KIT • SUGGESTIONS • MOBILE APPS • MONITORING PANELS • PLATFORM UTILITIES • READY TO USE SMART APPLICATIONS

MICROSERVICES & ADVANCED SMART CITY API

LIVING LAB - DEV TOOLS - COWORKING

IOT DIRECTORY • SERVICE MAP • RESOURCE MANAGER • DATA GATE • R STUDIO • ETL

BIG DATA - DATA ANALYTICS

DATA ANALYTICS TOOLS - MICRO-APPLICATIONS

PREDICTIONS • ANOMALY DETECTION • WHAT-IF ANALYSIS • TRAFFIC FLOW RECONSTRUCTION • ORIGIN-DESTINATION MATRICES • SOCIAL MEDIA ANALYSIS • OFFER VS DEMAND ANALYSIS • ENVIRONMENTAL DATA ANALYSIS AND PREDICTIONS • REAL TIME HEATMAPS • ROUTING • ALERTING • EARLY WARNING • PERSONAL AND VIRTUAL ASSISSTANTS • SMART SOLUTIONS • SMART SHARING • PARTECIPATORY

KM4CITY DATA AGGREGAT KNOWLEDGE BASE - EXPERT SYSTEM OF THE CITY – BIG DATA STORE

IOT MNG - DATA MNG - DATA INSPECTOR – PROCESS MNG – USER ENGAGEMENT – GDPR MNG …

| GIS | CITY UTILITIES | OPEN DATA | LEGACY & EXTERNAL SERVICES | PERSONAL DATA | IOT / IOE | BROKERS | KPI | INDUSTRY 4.0 | SOCIAL MEDIA |

FI-WARE

SMART CITIES REFERENCE ARCHITECTURE

- Is open to the Development of Applications leaving large space to developers
- Is centered on the Orion Broker that result central in the architecture: any Broker or data source is sending data to Orion
- No data shadow at the beginning, only recently they are adding data shadow on IOT Broker
- Security level is not clear, partially demanded to developers
- Visual Flexible IOT processing is not clearly provided
- **Limited API** for IOT data access
- **Knowage BI** presents several limitations in showing Smart City Data
- Market place on Open Data
- Support of Developers via Fi-Ware
- Deployed as VM and Dockers
- open source, not the application parts

VS

SNAP4CITY · KM4CITY

- Is open to the Development of Applications leaving large space and providing a **large set of ready to use applicative tools** and solutions to build their solutions on top or aside.
- Is fully distributed, **any kind of data source** can be ingested, automatically to form the Data Shadow.
- **Orion Broker is only one of the Brokers** that can be used. It can be also protected by Snap4City tech, with Mutual Authentication
- **Visual Flexible IOT processing is provided** as IOT App that is Node-RED plus Snap4City MicroServices suites
- **Advanced Smart City API** are provided on top of Knowledge Base
- **Dashboard Builder** has been designed for Smart City Data and automated dashboards' production
- **Market Place** for promoting, publishing and sharing Open Data, tools, processes, experiences
- Full Support for Living Lab of the city, coworking, tutorials
- Deployed as VM and Dockers, on cloud and on premise
- Fully support for Multi-tenancy
- Fully support federation of smart cities
- 100% open Source, including the management aspects

- **Comparison:** https://www.snap4city.org/467
- **Snap4City is an official Fi-Ware Solution via**
  - NGSI V1, V2 The IOT Orion Broker
  - IOT Orion Broker can connect JSON, MQTT, Lightweight M2M, LoraWAN, OPC, SigFOX, etc. see Fi-Ware Https://www.fiware.org
- **Snap4City is compatible** with all the above protocols
  - via IOT Orion Broker,
  - via direct connection on ETL processes on their corresponding IOT brokers, and/or
  - via IOT Applications.
- **Snap4City is also compatible** with many other protocols, see the table reported in page: https://www.snap4city.org/65
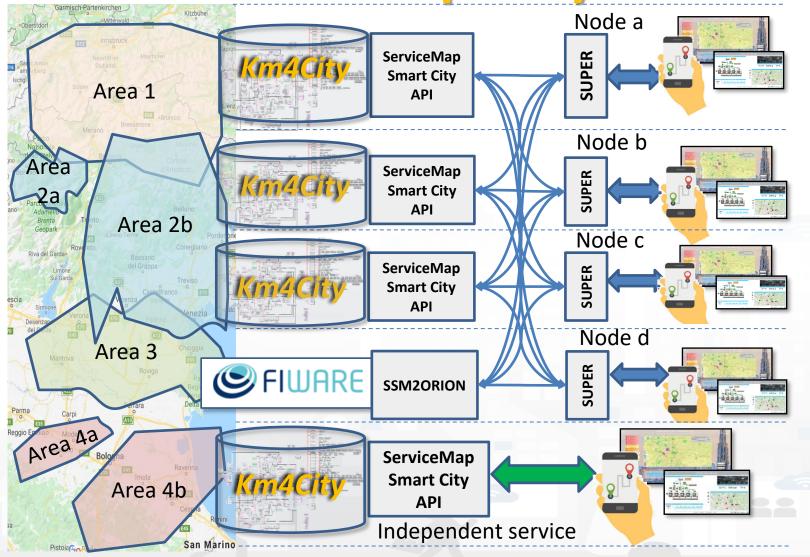
Federation of Snap4City Services
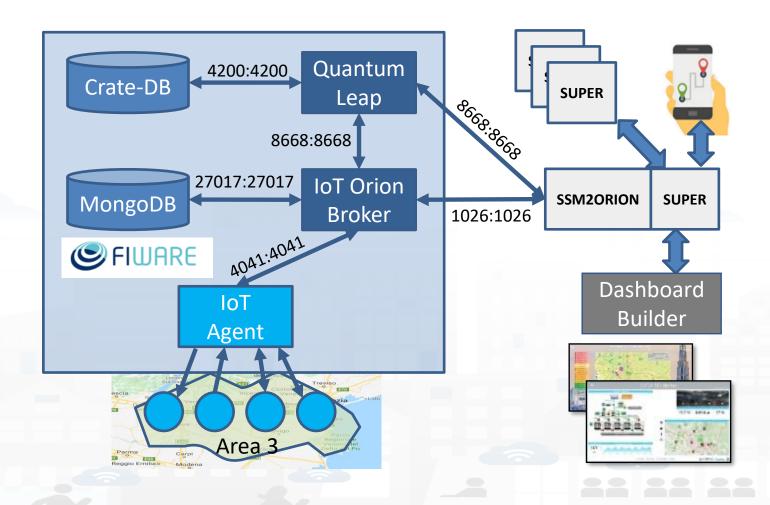
- A Mobile App may refer to one Smart City API Server (for Area 1) via SUPER and receive data from the Federated SUPERS (Area 2) if navigation, queries, etc. are leading to discover out of the addressed KB.

  - SUPER can be used for creating redundant and/or balanced distributed solutions for Federated KB. See Area 2, the two KB in the front.

  - Federated SUPER can have overlapped KB even totally.

  - A Mobile App can be developed to support multiple Smart City API servers, for balancing and

- The usage of Super is not mandatory so that separate services can be produced as well

- Super and Nodes presents the same Smart City APIs.

Federation of Snap4City vs IOT ORION Broker

Standards and Interoperability

Compliant with: AMQP, COAP, MQTT, OneM2M, HTTP, HTTPS, TLS, Rest Call, SMTP, TCP, UDP, NGSI, LoRa, LoRaWan, TheThingsNetwork, SigFOX, DATEX II, SOAP, WSDL, Twitter, FaceBook, Telegram, SMS, OLAP, MySQL, Mongo, HBASE, SOLR, SPARQL, EMAIL, FTP, FTPS, WebSocket, WebSocket Secure, ModBUS, OPC, GML, RS485, RS232, WFS, WMS, ODBC, JDBC, Elastic Search, Phoenix, XML, JSON, CSV, db, GeoJSON, Enfuser FMI, Android, Raspberry Pi, Local File System, ESP32, Libelium, IBIMET/IBE, OBD2, SVG, XLS, XLSX, TXT, HTML, CSS, KNX, Enocean, Zigbee, DALI, ISEMC, Alexa, Sonoff, HUE Philips, Tplink, BACnet, TALQ, Copernicus, etc.   https://www.snap4city.org/65
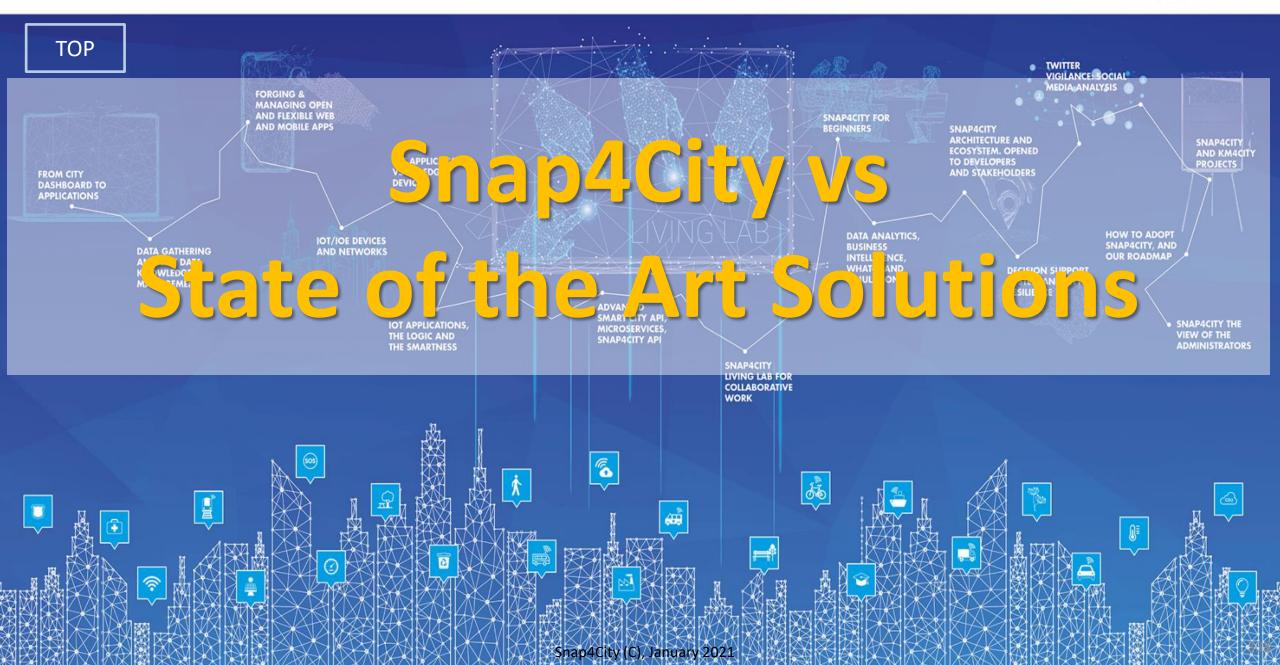
- In Snap4City you can chose to connect your devices at Snap4City Platform in different manners:
  – (a) directly to Snap4City: IOT App, Brokers, MyKPI, etc., or
  – (b) via an IOT Orion Broker (external IOT Broker or those provided by Snap4City), or
  – (c) via any third party IOT Brokers in any protocol you have.
- **Snap4City has**
  – **Improved IOT Orion Broker** with the so called Orion Broker Filter (Orion Broker Filter, NGSI Security Wrapper) which is a secure wrapper for NGSI V1 and V2 protocol for enforcing Mutual Authentication, Security, roles, etc.
  – **Produced open hardware and open software NGSI Compliant:** as
    - **IOT Devices** with mutual authentication and security based for NGSI on: Android, Arduino and ESP32, IOT Button, etc.
    - **IOT Edge** devices with mutual authentication and security based for NGSI on: Raspberry PI, Windows, Linux.

TOP

Snap4City vs State of the Art Solutions

Market Solutions
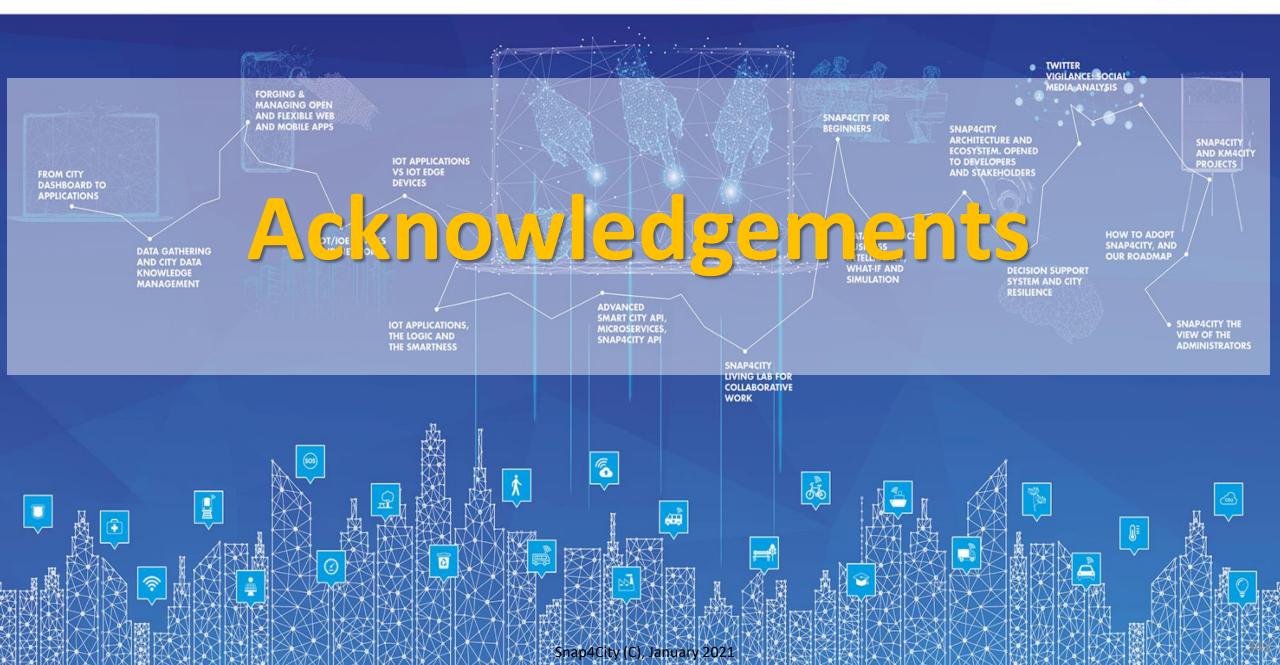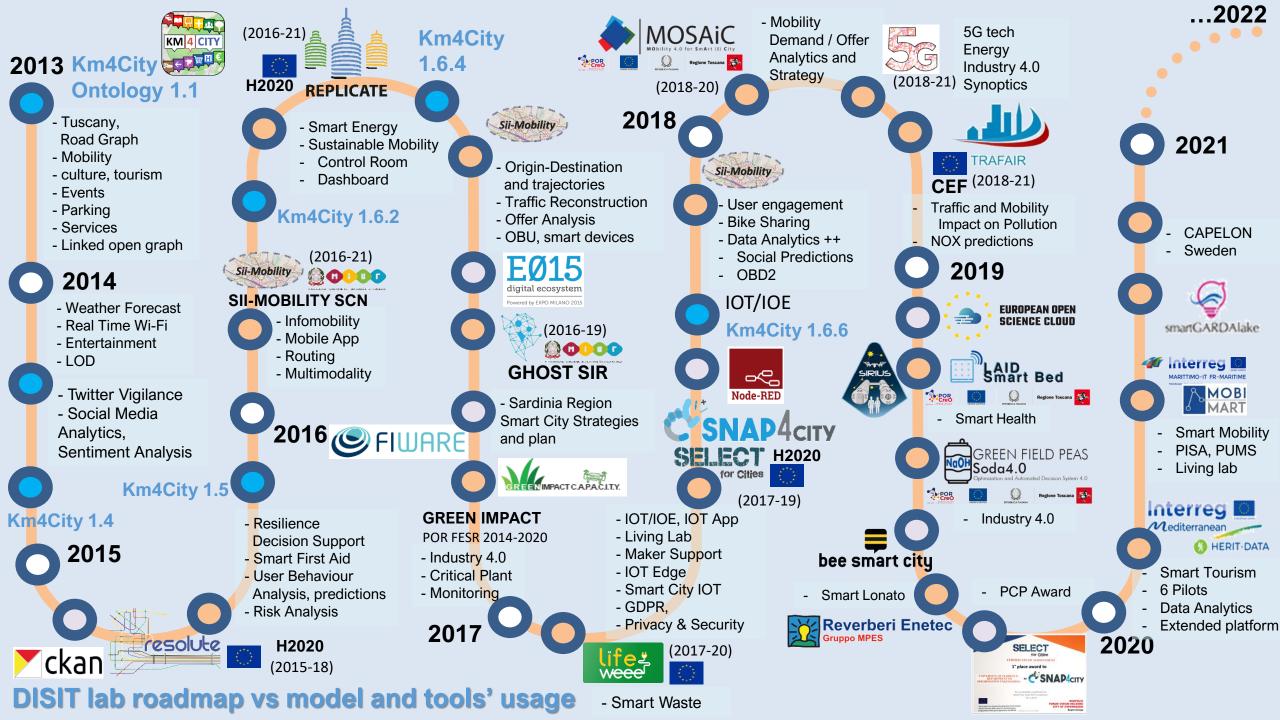
	IOT Discovery Abstraction	Authentication, Authorization	Security end-2-end, secure on IOT and Dashboards	Open HW and Open SW	Integrated Community Management	Data Types: IOT Devices, IOT App, Dashboard, Data	Data Type: Publish/share, Delegation, Consent and change	Data Type: Download and Delete	Auditing on Data Type Access	Open Source end-to-end	Scalability IOT	Visual Programming end-to-end applications	Advanced Smart City API, MicroServices	Multi Domain Semantic Platform	Standard based Modules and IOT, Open Devices	Resource Sharing	Data Analytics integrated	Dashboard H24/7, protected connection	Multi-protocol on IOT
		G				G	G	G	G										
Snap4City	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
KAA [53]	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	(Y)	N	N	Y	Y
Thingsboard [55]	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	N	N	N	N	N	N	Y	MQTT,coap, http
IOT eclipse.org [56]	N	N	N	(Y)	N	Y	N	N	N	Y	Y	N	N	N	Y	N	N	N	Y
IOT IGNITE [57]	N	Y	N	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	N	N	N	Y	MQTT
FIWARE [47]	N	N	N	N	N	N	N	N	N	Y	(Y)	(N)	Y	N	N	N	N	Y	Y
ARM mbed IoT [48]	Y	Y	Y	Y	Y	N	(N)	N	Y	Y	Y	N	N	N	Y	N	N	Y	Limited
Airvantage [51]	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	N	N	N	N	N	N	Y	MQTT, HTTP
AWS [43]	Y	Y	Y	N	N	(N)	Y	Y	Y	N	Y	N	N	N	Y	Y	(Y)	Y	Limited
Azure IOT [44]	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	N	Y	Y	(Y)	Y	Limited
PTC ThingWorkx [59]	N	Y	Y	Y	N	Y	N	N	N	Y	Y	Y	N	N	Y	N	Y	Y	Y
Bosch IoT Suite [58]	Y	Y	Y	Y	Y	(Y)	(N)	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y
CISCO Jasper [55]	Y	Y	Y	Y	N	(Y)	(N)	N	Y	N	Y	N	N	N	N	--	(Y)	Y	N
Siemens MindSphere [60]	Y	Y	Y	(Y)	N	Y	(N)	Y	Y	N	Y	Y	N	N	Y	N	Y	Y	Y
Carriots [54]	Y	Y	Y	(Y)	N	Y	N	Y	N	Y	N	Y	N	N	N	--	N	Y	MQTT
Google IOT [45]	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	N	N	N	N	(Y)	(Y)	MQTT, HTTP
Homekit Apple [50]	Y	Y	Y	Y	N	Y	N	N	N	Y	(Y)	N	N	N	N	Y	N	Y	Limited
Smarthing Samsung [52]	Y	Y	Y	Y	Y	Y	(Y)	Y	Y	N	(Y)	N	N	N	N	N	N	Y	Limited

Acknowledgements

DISIT lab roadmap vs model and tools' usage

2013 Km4City Ontology 1.1
- Tuscany, Road Graph
- Mobility
- culture, tourism
- Events
- Parking
- Services
- Linked open graph

2014
- Weather Forecast
- Real Time Wi-Fi
- Entertainment
- LOD
- Twitter Vigilance
- Social Media Analytics, Sentiment Analysis

Km4City 1.4

2015
- Resilience Decision Support
- Smart First Aid
- User Behaviour Analysis, predictions
- Risk Analysis

ckan
resolute
H2020
(2015-18)

Km4City 1.5

(2016-21)
H2020 REPLICATE
- Smart Energy
- Sustainable Mobility
- Control Room
- Dashboard

Km4City 1.6.2

(2016-21)
Sii-Mobility
SII-MOBILITY SCN
- Infomobility
- Mobile App
- Routing
- Multimodality

2016 FIWARE

Km4City 1.6.4

Sii-Mobility
- Origin-Destination and trajectories
- Traffic Reconstruction
- Offer Analysis
- OBU, smart devices

E015 digital ecosystem
Powered by EXPO MILANO 2015

(2016-19)
GHOST SIR
- Sardinia Region Smart City Strategies and plan

GREEN IMPACT C.A.P.A.C.I.T.Y.

GREEN IMPACT
POR FESR 2014-2020
- Industry 4.0
- Critical Plant
- Monitoring

2017

life weee
(2017-20)
- Smart Waste

MOSAiC
MObility 4.0 for SmArt (i) City
POR CreO
Regione Toscana
(2018-20)

2018

Sii-Mobility
- User engagement
- Bike Sharing
- Data Analytics ++
  - Social Predictions
  - OBD2

IOT/IOE

Km4City 1.6.6

Node-RED

SNAP4CITY
SELECT for Cities
H2020
(2017-19)

- IOT/IOE, IOT App
- Living Lab
- Maker Support
- IOT Edge
- Smart City IOT
- GDPR,
- Privacy & Security

- Mobility Demand / Offer Analytics and Strategy

5G tech Energy Industry 4.0 Synoptics
(2018-21)

5G

TRAFAIR
CEF (2018-21)
- Traffic and Mobility Impact on Pollution
- NOX predictions

2019

EUROPEAN OPEN SCIENCE CLOUD

LAID Smart Bed
POR CreO Regione Toscana
- Smart Health

SIRIUS

GREEN FIELD PEAS
Soda4.0
Optimization and Automated Decision System 4.0
POR CreO Regione Toscana
- Industry 4.0

bee smart city
- Smart Lonato

Reverberi Enetec
Gruppo MPES

- PCP Award

SELECT for Cities
CERTIFICATE OF ACHIEVEMENT
1° place award to
SNAP4CITY

2020

...2022

2021

- CAPELON
- Sweden

smartGARDAlake

Interreg MARITTIMO-IT FR-MARITIME
MOBI MART
- Smart Mobility
- PISA, PUMS
- Living lab

Interreg Mediterranean
HERIT-DATA
- Smart Tourism
- 6 Pilots
- Data Analytics
- Extended platform

Main running instances

- Sii-Mobility → mobility and transport, sustainability
- REPLICATE → ICT, smart City Control room, Energy, IOT
- RESOLUTE → Resilience, ICT, Big Data
- GHOST → Strategies, smart city
- TRAFAIR → Environment & transport
- MOSAIC → mobility and transport
- WEEE Life → Smart waste, environment
- Smart Garda Lake → Castelnuovo del Garda
- 5G → Industry 4.0 vs SmartCity
- Green Impact → Industry 4.0, Chemical Plant
- SmartBed (laid → smart health
- Green Field Peas (soda) → Industry 4.0, Chemical plant
- MobiMart and PISA Agreement → data aggregation, mobility and transport, Living Lab
- Lonato del Garda → smart parking, environment
- Herit Data → tourism, culture and management
- ISPRA JRC → site management and services
- Capelon (Sweden) → smart light solutions

Acknowledgements

- Thanks to the European Commission for founding. All slides reporting logo of **Snap4City** https://www.snap4city.org of **Select4Cities H2020** are representing tools and research founded by European Commission for the **Select4Cities** project. **Select4Cities** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation Programme (grant agreement n° 688196)

- **TRAFAIR is a CEF** project. All slides reporting logo of TRAFAIR project are representing tools and research founded by the EC on CEF programme http://trafair.eu/

- Thanks to the European Commission for founding. All slides reporting logo of **REPLICATE H2020** are representing tools and research founded by European Commission for the REPLICATE project. **REPLICATE** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation Programme (grant agreement n° 691735).

- Thanks to the European Commission for founding. All slides reporting logo of **RESOLUTE H2020** are representing tools and research founded by European Commission for the RESOLUTE project. **RESOLUTE** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation Programme (grant agreement n° 653460).

- Thanks to the MIUR for co-founding and to the University of Florence and companies involved. All slides reporting logo of **Sii-Mobility** are representing tools and research founded by MIUR for the Sii-Mobility SCN MIUR project.

- **Km4City** *is an open technology and research line of DISIT Lab exploited by a number of projects. Some of the innovative solutions and research issues developed into projects are also compliant and contributing to the Km4City approach and thus are released as open sources and are interoperable, scalable, modular, standard compliant, etc.*

Snap4City (C), January 2021

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DISIT thanks to

Herit Data: Tourism and Mng. https://herit-data.interreg-med.eu/
Snap4City: IOT/IOE smart city www.snap4city.org
Trafair: CEF project with several Cities http://trafair.eu/
Mosaic: Mobility and transport model
Km4City: http://www.km4city.org
REPLICATE H2020, SCC1, EC flagship
    http://replicate-project.eu/
Sii-Mobility SCN MIUR: http://www.sii-mobility.org
Feedback: retail and GDO Big Data analytics
5G with 3G-Wind, Open Fiber, Estra
Coll@bora Social Innovation, MIUR:
    http://www.disit.org/5479
RESOLUTE H2020, EC:
    http://www.resolute-eu.org
TRACE-IT, RAISSS, TESYSRAIL, …
Mobile Emergency:
    http://www.disit.org/5404

Trace-IT
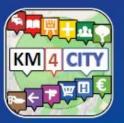
RAISSS

Further readings

https://www.snap4city.org/108

- HOW TO: create a Dashboard in Snap4City
- HOW TO: add a device to the Snap4City Platform
- HOW TO: add data sources to the Snap4City Platform
- HOW TO: define privacy rules for personal data, produced by the end-users own device
- HOW TO: Develop Smart Applications, Snap4City development Life Cycle
- HOW TO: HLT vs Ingestion, and HLT vs Widgets
- HOW TO: Develop an IOT Application for Data Ingestion
- HOW TO: Upload data into Knowledge Base, ServiceMap (triple upload)
- HOW TO: Create as set of Devices with BulkProcessing
- HOW TO: Create an IOT Device Model
- HOW TO: Create an IOT Device Instance from IOT Directory tool

SNAP4CITY KM4CITY

Be smart in a SNAP!

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

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