



UNIVERSITÀ
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DINFO
DIPARTIMENTO DI
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DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB

Smart City Dashboards: Design, Development and Evaluation

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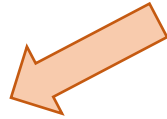
7 – 9 September 2020

Overview

1. Introduction
2. Snap4City Dashboard Builder
3. Smart City Dashboard Evaluation

Overview

1. Introduction



2. Snap4City Dashboard Builder

3. Smart City Dashboard Evaluation

1. Introduction – Scenario and Requirements

Smart Cities Challenges & Requirements

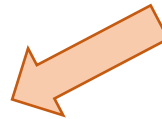


- *Retrieve historical and real-time data from different sources (IoT and mobile devices, open data, city sensors, web-data, social data etc...)*
- *Ensure interoperability with various IoT brokers, protocols and devices*
- *Visualize and analyze data through different and customizable graphical and interactive tools (Smart City Dashboards and Widgets).*

Overview

1. Introduction

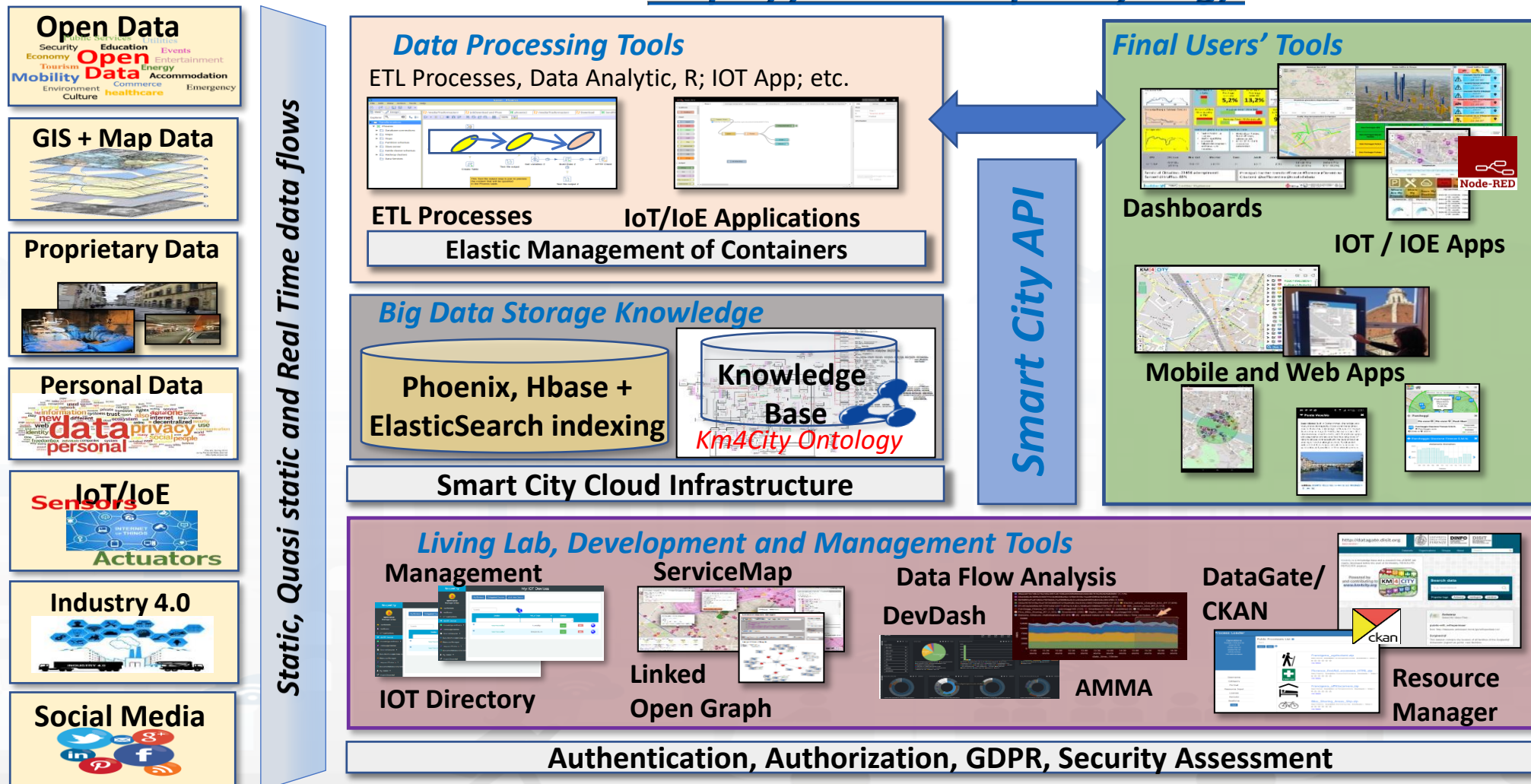
2. Snap4City Dashboard Builder



3. Smart City Dashboard Evaluation

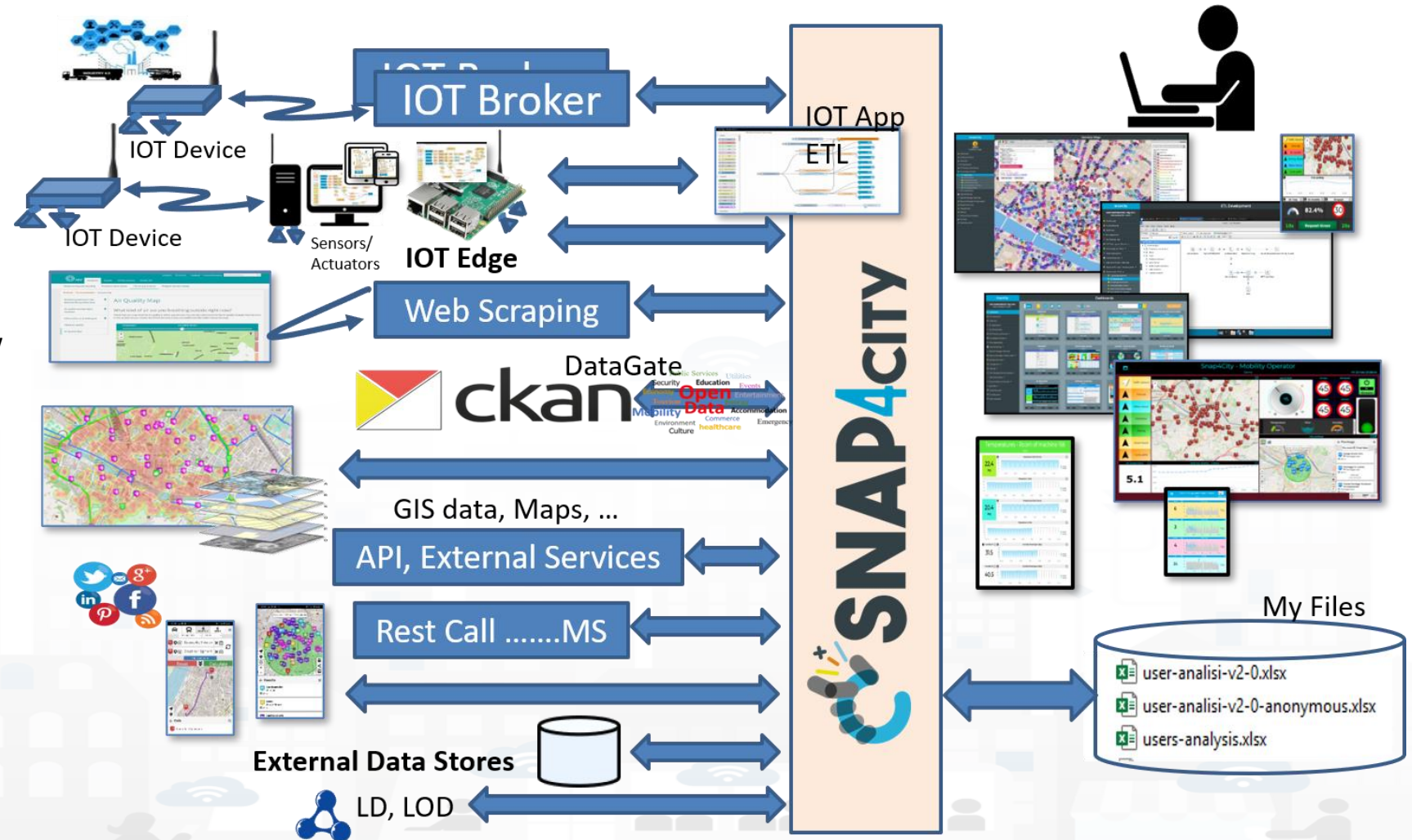
2. Snap4City Dashboard Builder – Architecture

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

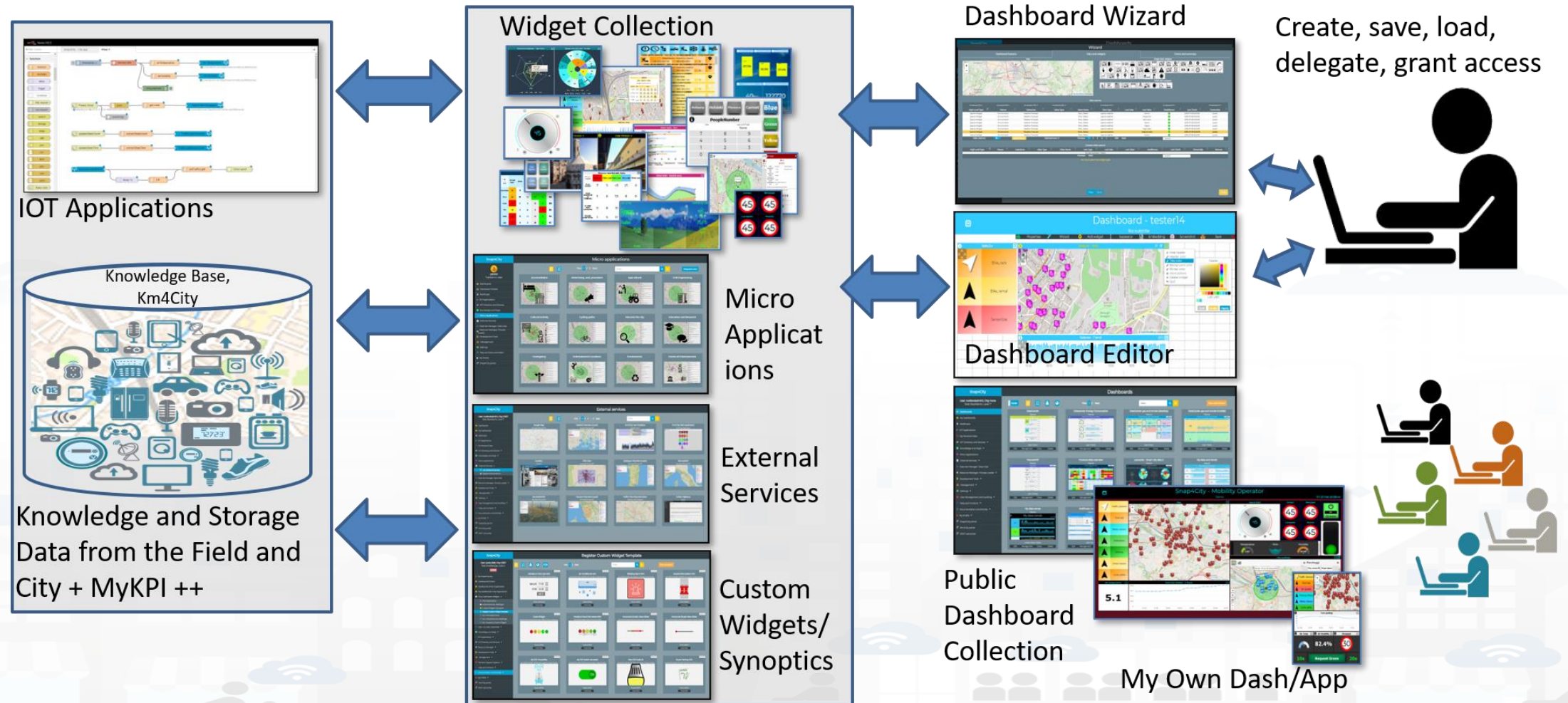


2. Snap4City Dashboard Builder – Data, Flows and Protocols

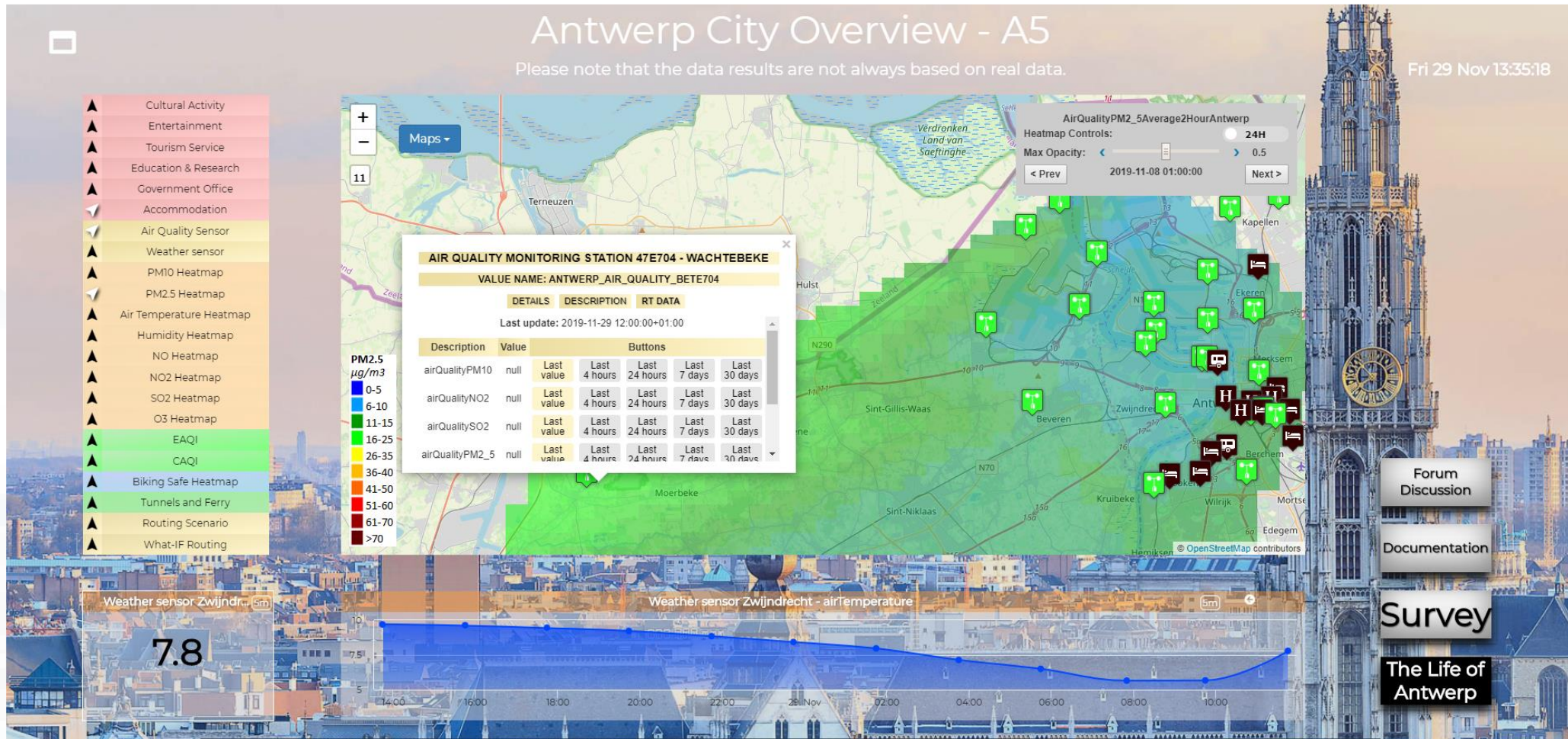
- **Open Data:**
 - Data gate, Open Data Portals
 - ETL processes (PULL)
 - IOT Application processes
- **IOT Networks:**
 - Multiple IOT Brokers (IOT Orion Broker, RabbitMQ, ActiveMQ ...)
 - IOT Application processes, data driven or PULL
 - IOT Brokers (Push) → IOT Shadow
- **Web Pages:**
 - Web scraping, crawling processes
- **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



2. Snap4City Dashboard Builder – Dashboard Creation

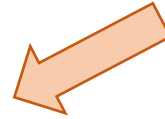


2. Snap4City Dashboard Builder – Dashboard Overview



Overview

1. Introduction
2. Snap4City Dashboard Builder
3. Smart City Dashboard Evaluation



2. Smart City Dashboard Assessment and Evaluation

- **Aim of the Dashboard Builder evaluation**: *assess how easy it is to use the Dashboard Wizard for dashboard creation, matching the user intention selecting the different widget icons with respect to the results obtained in the dashboard creation.*
- **Assessment modality**: *users attending a general training on the platform (with a focus in the creation of Dashboards) were asked to create some dashboards and report the performed steps/actions in a written form.*
- **Evaluation**: *A vote has been assigned, depending on the percentage of matched widgets proposed with respect to one of the possible solutions (100% means that all the necessary widgets have been used).*

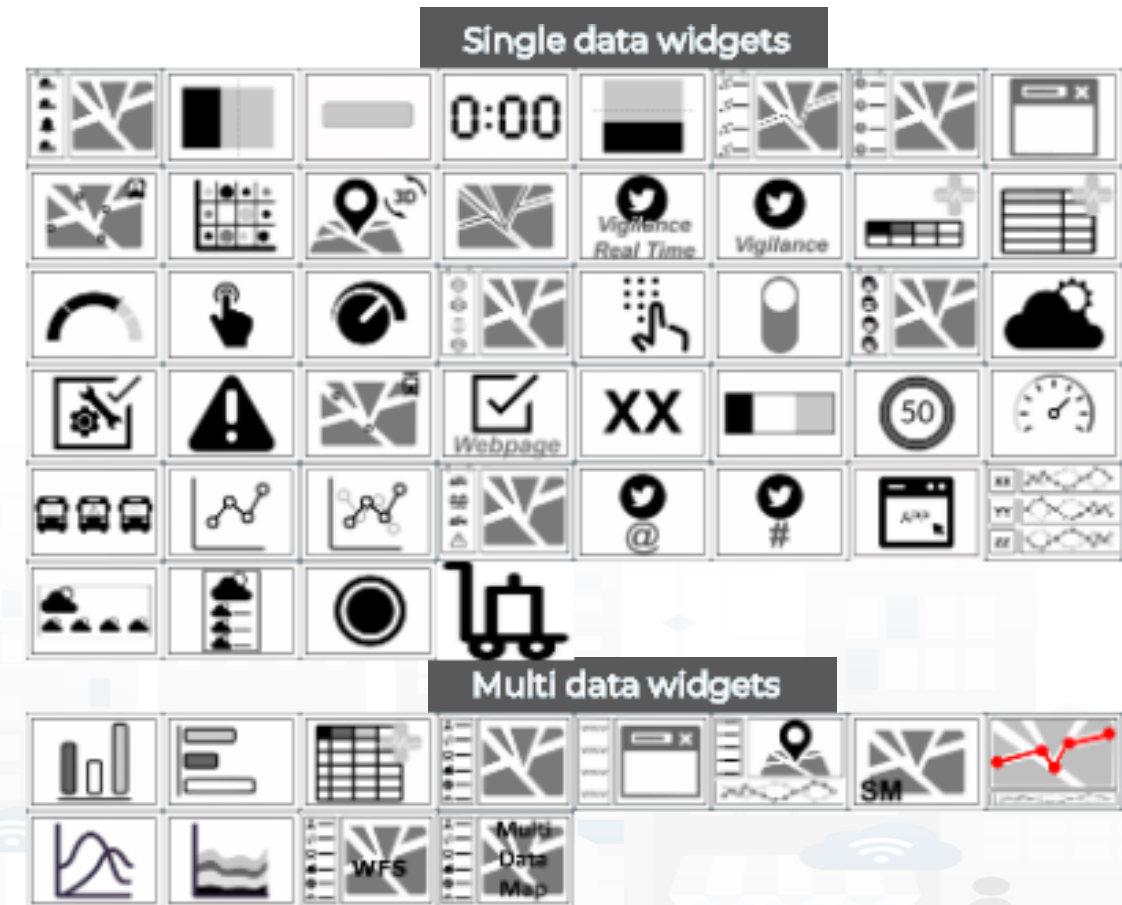
2. Smart City Dashboard Assessment and Evaluation – Florence

➤ Proposed Exercises:

- ❖ **Ex1:** Create a Dashboard for the visualization of Sensors values: actual (real-time data) and their temporal trend (historical data). The sensors to be selected should be located in Florence around a point of your interest (home, work, study), report data regarding: environment, traffic, parking, pollution, etc. 20 minutes of time.
- ❖ **Ex2:** Create a dashboard for the visualization of geolocated services (POI, Sensors, heat map,..), with additional widget to see the time trend. 20 minutes of time.
- ❖ **Ex3:** Create a dashboard for the visualization of MyKPI (users' personal Key Performance Indicators) regarding trajectories registered on users' personal devices. We suggest to open wizard and search for trajectories of your mobile. 15 minutes of time.

Ex. 1) Create a Dashboard for the visualization of sensors values: actual and their trend

- The sensors to be selected should
 - Be located downtown in Florence around a POINT of YOUR interest: home, work, study, etc.
 - Report data regarding: environment, traffic, parking, pollution, etc.
- **We suggest to:**
 - Understand how to work with data by using the Data Inspector
 - Create a new Dashboard by using the Wizard
 - Customize look and fill of the Dashboard and widgets
- Time: 20 minutes



Identify your Widgets

2. Smart City Dashboard Assessment and Evaluation – Florence

➤ Evaluation Results (summary):

- ❖ *Out of the 30 participants in the dashboard building training, 22 responded to our questionnaires.*
- ❖ 90% of the users completed in time the development of the Dashboards that satisfy the requirements.
- ❖ The reported speedup achieved by using Snap4City, with respect to any other platform, is 7 times on building dashboards: only 9 people reported the specific tool they used to build dashboards: 44% use Penthao (ETL tool), which it is not an actual Dashboard Builder, and 33% use Microsoft Power BI. A variety of other tools were reported, including Arcgis, OnlineClarity, Geoserver, Grafana, Hortonworks, Mapseruer, Prometheus, Qlick, Redssh, Superset, Talend Data Integration, Traffic Supervisor.
- ❖ 56.70% were very satisfied and 37.11% were somewhat satisfied with the training day.
- ❖ 90% were happy with the dashboards, among them: 49.38% were very satisfied; 93% stated that the dashboard builder would be useful for their work; 51.72% thought it would be very useful in their daily work.
- ❖ 72.63% were more than somewhat satisfied with the easiness for the dashboard production, 96.51% were more than somewhat satisfied with the completeness of the dashboard, and more than the 40% were very satisfied.
- ❖ Some users reported, as a desired improvement, a clearer graphics for widget icons in the Dashboard Wizard, which currently can sometimes result confusing, due to the high number of widgets, some of them having similar functionalities.

2. Smart City Dashboard Assessment and Evaluation – Helsinki and Antwerp

- We have conducted a usage assessment of Snap4City dashboards by city officials and ICT officials from Antwerp (August 21st, 2019) and Helsinki (June 11th, 2019).
- In Helsinki, we had 8 participants from Select4Cities consortium and 9 participants from the City of Helsinki, mainly City Officials. In Antwerp, we had 15 participants.
- A total of more than 4.6 million of minutes have been spent on Dashboards with a total of more than 41,000 accesses to Dashboards.

2. Smart City Dashboard Assessment and Evaluation – Helsinki and Antwerp

Total Dashboards Usage

Dashboard name	ID	#Accesses	#Minutes	#Days	Status
Antwerp City Overview (A5a)	1407	11.988	855.665	90	Public
The Life of Antwerp (A5b)	1706	4.238	416.517	61	Private
Antwerp vs Helsinki Comparison (A6)	1756	448	42.642	29	Private
Antwerp vs Florence Comparison (A6)	1757	255	19.892	18	Private
Helsinki City Overview (H5a)	1406	14.629	2.057.898	92	Public
The Life of Helsinki (H5b)	1752	6.124	640.136	66	Public
Enfuser vs RealTime Comparison (H4) daily	1732	895	117.159	43	Public
Enfuser vs RealTime Comparison (H4) weekly	1735	407	35.395	31	Private
Helsinki vs Antwerp Comparison (H6)	1740	1.349	331.698	42	Public
Helsinki vs Florence Comparison (H6)	1741	1.001	114.332	42	Private
total		41.334	4.631.334		
Total for Antwerp		16.929	1.334.716	198	
Total for Helsinki		24.405	3.296.618	316	

2. Smart City Dashboard Assessment and Evaluation – Helsinki and Antwerp

Average Dashboards Usage

Dashboard name	AVG Min/day	AVG Acc/Day	AVG Min/Acc	Status
Antwerp City Overview (A5a)	9507,4	133,2	71,4	Public
The Life of Antwerp (A5b)	6828,1	69,5	98,3	Private
Antwerp vs Helsinki Comparison (A6)	1470,4	15,4	95,2	Private
Antwerp vs Florence Comparison (A6)	1105,1	14,2	78,0	Private
Helsinki City Overview (H5a)	22368,5	159,0	140,7	Public
The Life of Helsinki (H5b)	9699,0	92,8	104,5	Public
Enfuser vs RealTime Comparison (H4) daily	2724,6	20,8	130,9	Public
Enfuser vs RealTime Comparison (H4) weekly	1141,8	13,1	87,0	Private
Helsinki vs Antwerp Comparison (H6)	7897,6	32,1	245,9	Public
Helsinki vs Florence Comparison (H6)	2722,2	23,8	114,2	Private
Total for Antwerp	18.911	232	343	
Total for Helsinki	46.554	342	823	

Thanks For Your Attention!

Q&A ?