

# Soluzioni open source per l'interoperabilità di dati dinamici

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The Urban Lab of Europe!

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# Ferrara

Air quality

## AIR BREAK- Co-producing healthy clean commuting air spots in town

“The challenge for protecting the environment and improving the quality of the air we breathe will be crucial for the next years. It is a battle that concerns the health and quality of life of millions of European citizens and, for this reason, mayors and administrators have

### The project in numbers

14

Network of IoT sensors for monitoring air quality and on-demand samplers of ambient air and odors for later chemical/olfactometric analyses

500

citizens involved in the monitoring phase

10%

reduction of air pollutants in relation with commuting analysis

240 000

Kg/yr absorbed air pollutants by newly planted species

3000

number of citizens involved





## USAGE project

Home

News & Media

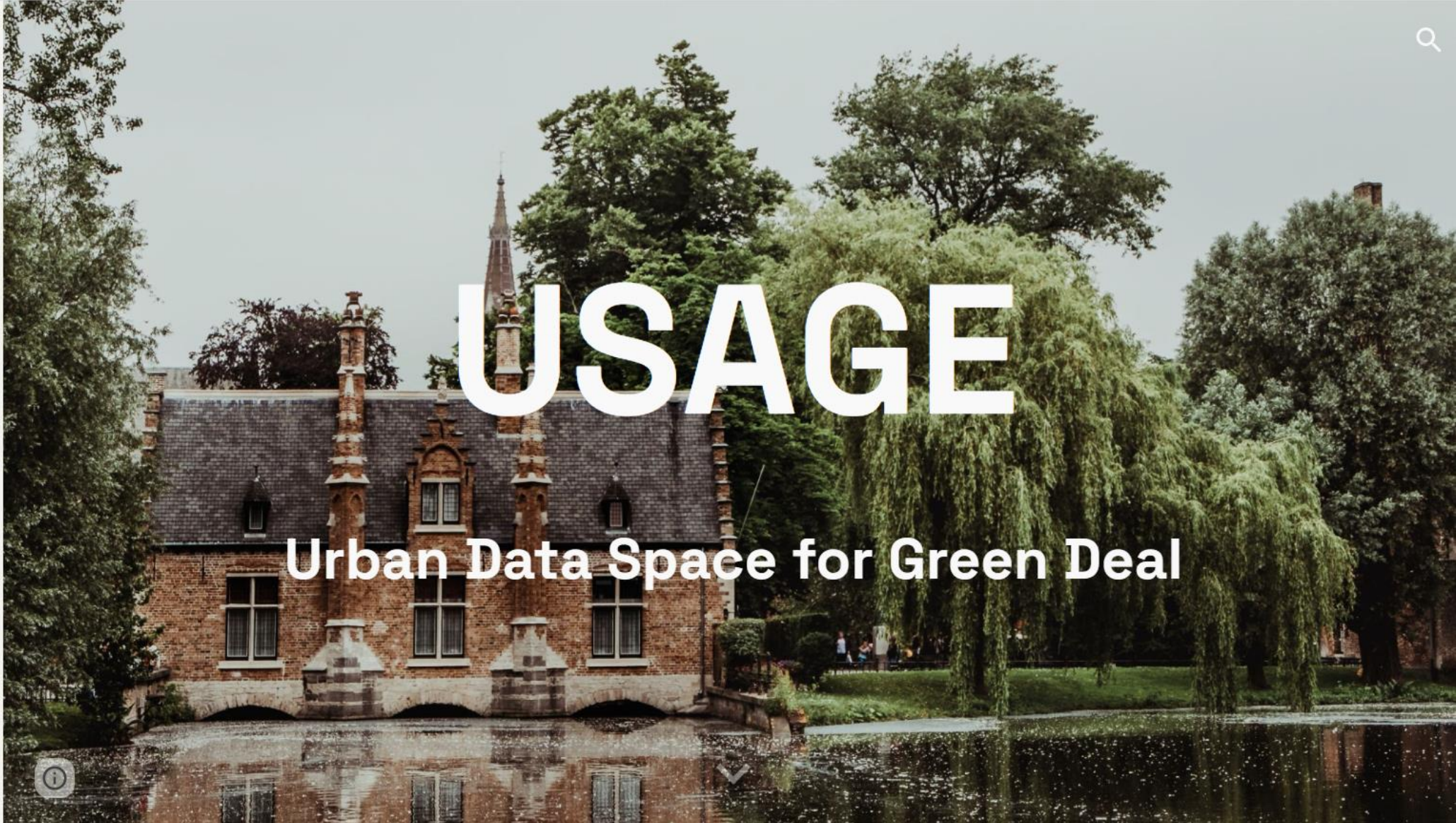
Events

Challenges

People&Partners

Synergies

Resources





## Cerca i dati

Per es. ambiente



Tag popolari

psc

mobilità

piano urbanistico g...

pug

sistemi

procedimento

commercio

elettorale

quadro conoscitivo

criter

## Numeri e dati di Ferrara

Il portale open data del comune di Ferrara ha lo scopo di raccogliere, rendere disponibili e accessibili per un eventuale riutilizzo sia da parte delle altre pubbliche amministrazioni che dei privati, i dati e le informazioni prodotti dal Comune nell'esercizio delle proprie funzioni istituzionali.

Il Comune persegue con grande impegno lo scopo di fornire dati



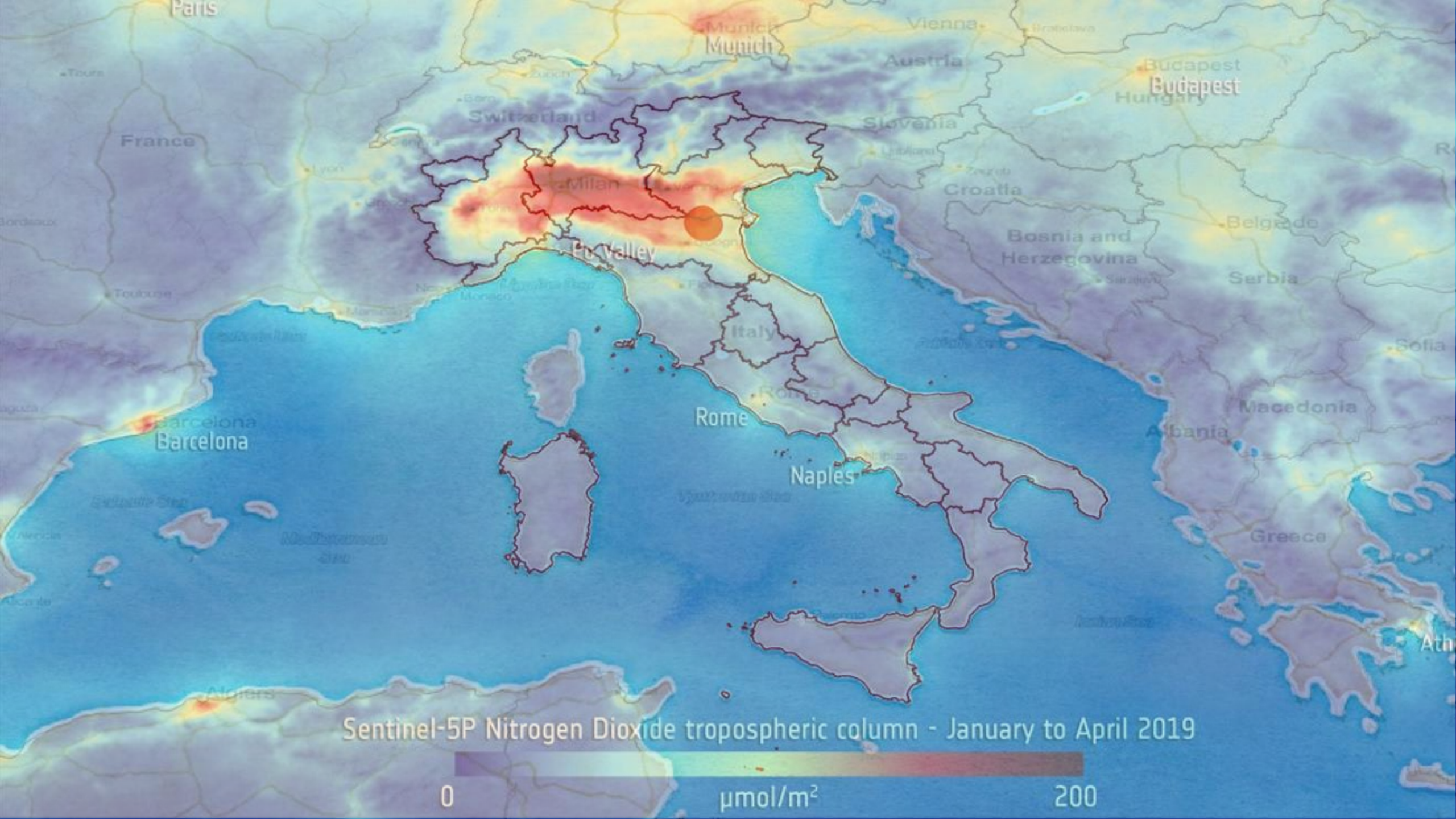


# Scaletta

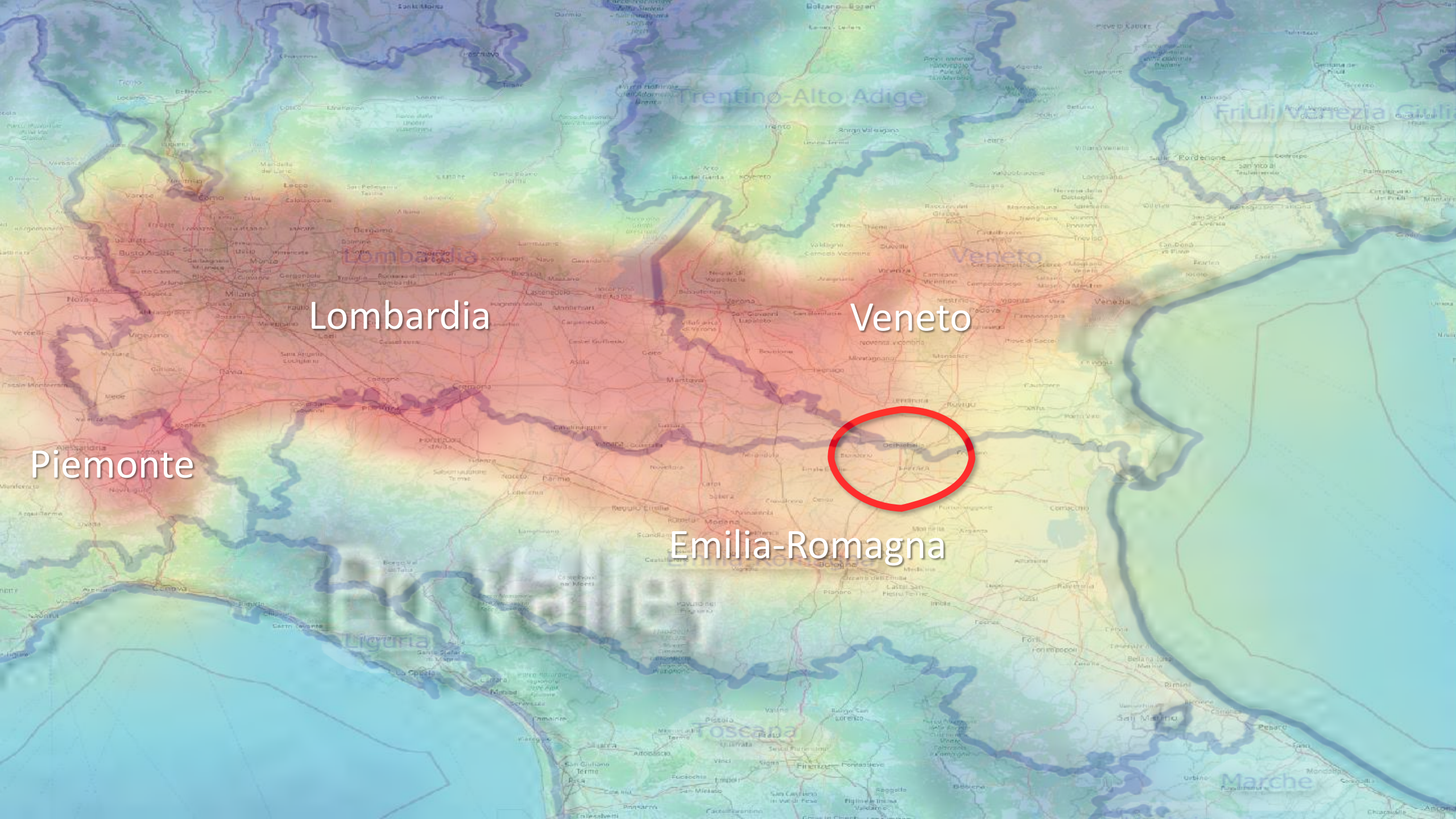
- Contesto (da dove siamo partiti)
- Soluzioni e software
- Demo di dati dinamici da endpoint SensorThings
- 'Umanizzare' i dati dinamici

# Scaletta

- Contesto (da dove siamo partiti)
- Soluzioni e software
- Demo di dati dinamici da endpoint SensorThings
- 'Umanizzare' i dati dinamici







Lombardia

Veneto

Piemonte

Emilia-Romagna



# Dati di qualità aria in pianura padana

## Emilia-Romagna:

- bulk download dati ultimi 60 giorni (tutte le stazioni e tutti gli inquinanti)
- API disponibili (proprietarie, CKAN)
- file CSV (filtro temporale in download)
- struttura dati:

<b>_id</b>	<b>station_id</b>	<b>variable_id</b>	<b>reftime</b>
6273812	9000021	1	2021-04-16T01:00:00
6330411	9000021	1	2021-05-02T15:00:00
6227892	9000021	1	2021-04-03T01:00:00
6291726	9000021	1	2021-04-21T01:00:00
6291727	9000021	1	2021-04-21T02:00:00
6227893	9000021	1	2021-04-03T02:00:00
6280643	9000021	1	2021-04-18T06:00:00
6280656	9000021	1	2021-04-18T19:00:00
6252156	9000021	1	2021-04-10T04:00:00
6291735	9000021	1	2021-04-21T10:00:00

# Dati di qualità aria in pianura padana

## Veneto:

- bulk download medie annuali (tutte le stazioni e tutti gli inquinanti)
- API non disponibili/descritte
- file CSV o XLS
- struttura dati:

Provincia	Comune	Codice id	Stazione d	Tipologia	2018 - PM10		2019 - PM10		2020 - PM10		2021 - PM10		media anno (µg/m3)
					2018-PM1	2018-PM10	2019-PM1	2019-PM10	2020-PM1	2020-PM10	2021-PM1	2021-PM10	
Belluno	Belluno	IT1594A	BL_Parco	BU	4	16	4	17	4	16	5	17	
Belluno	Belluno	IT2245A	BL_La Cerv	TU	5	22	8	22	8	20	8	21	
Belluno	Feltre	IT1619A	Area Feltri	BU/BS	28	23	30	23	16	20	33	21	
Belluno	Pieve d'Al	IT1790A	Pieve d'Al	BS/BR	0	12	2	13	3	13	3	13	
Belluno	Falcade	IT1864A	Passo Vall	BR	-	-	-	-	-	-	-	-	
Padova	Padova	IT2070A	PD_Granzi	IU	63	37	70	37	84	37	60	33	
Padova	Padova	99902	PD_aps1	IU	61	35	71	36	87	37	62	32	
Padova	Padova	99903	PD_aps2	IU	47	32	57	32	78	32	54	28	
Padova	S.Giustina	IT2071A	Alta Padov	BR	52	32	63	33	74	34	56	31	
Padova	Padova	IT1453A	PD_Mand	BU	60	35	61	32	80	32	51	28	
Padova	Cinto Eug	IT1870A	Parco Coll	BR	35	27	43	27	61	28	35	23	
Padova	Este	IT1871A	Este	TU/IS	57	32	50	28	72	29	44	25	
Padova	Monselice	99910	Monselice	IU/BU	44	31	50	32	69	31	41	27	
Padova	Padova	IT1880A	PD_Arcella	TU/TU	60	35	65	35	84	36	59	32	



# Dati di qualità aria in pianura padana

## Lombardia:

- bulk download dati (tutte le stazioni e tutti gli inquinanti)
- API disponibili (proprietarie, Socrata)
- file CSV (filtro temporale in download)
- struttura dati:

IdSensore	Data	Valore	Stato
5504	08/01/2021 12:00	62.4	VA
5504	09/01/2021 00:00	108.6	VA
5504	08/01/2021 15:00	64.2	VA
5504	08/01/2021 13:00	64.2	VA
5504	08/01/2021 22:00	86.2	VA
5504	08/01/2021 23:00	100.8	VA
5504	08/01/2021 14:00	56.1	VA
5504	08/01/2021 21:00	78.6	VA
5504	08/01/2021 19:00	78.9	VA
5504	08/01/2021 17:00	69	VA
5504	08/01/2021 16:00	65.5	VA

# Dati di qualità aria in pianura padana

## Piemonte:

- download dati solo per singola stazione e singolo inquinante
- API non disponibili/descritte
- file CSV (max 365 days)
- struttura dati:

Data rilevamento	Ora	Id Rete Monitoraggio	Codice Istat Comune	Progr. Punto Comune	Denominazione Stazione	Id Parametro	Descr. Parametro	Id Un. misura	Descr. Un. misura
01/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
02/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
03/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
04/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
05/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
06/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
07/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
08/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo
09/05/2021	23:59	13	1028	801	Borgaro T. - Caduti	PM10_GBV	PM10 - Basso Volume	23	microgrammi / metro cubo



# Scaletta

- Contesto (da dove siamo partiti)
- Soluzioni e software
- Demo di dati dinamici da endpoint SensorThings
- 'Umanizzare' i dati dinamici

## OGC SensorThings API

[1\) Overview](#)

[2\) Downloads](#)

[3\) Related News](#)

### 1) Overview

The OGC SensorThings API provides an open, geospatial-enabled and unified way to interconnect the Internet of Things (IoT) devices, data, and applications over the Web. At a high level the OGC SensorThings API provides two main functionalities and each function is handled by a part. The two parts are the Sensing part and the Tasking part. The Sensing part provides a standard way to manage and retrieve observations and metadata from heterogeneous IoT sensor systems. The Tasking part is planned as a future work activity and will be defined in a separate document as the Part II of the SensorThings API.

### 2) Downloads

Active OGC standards:

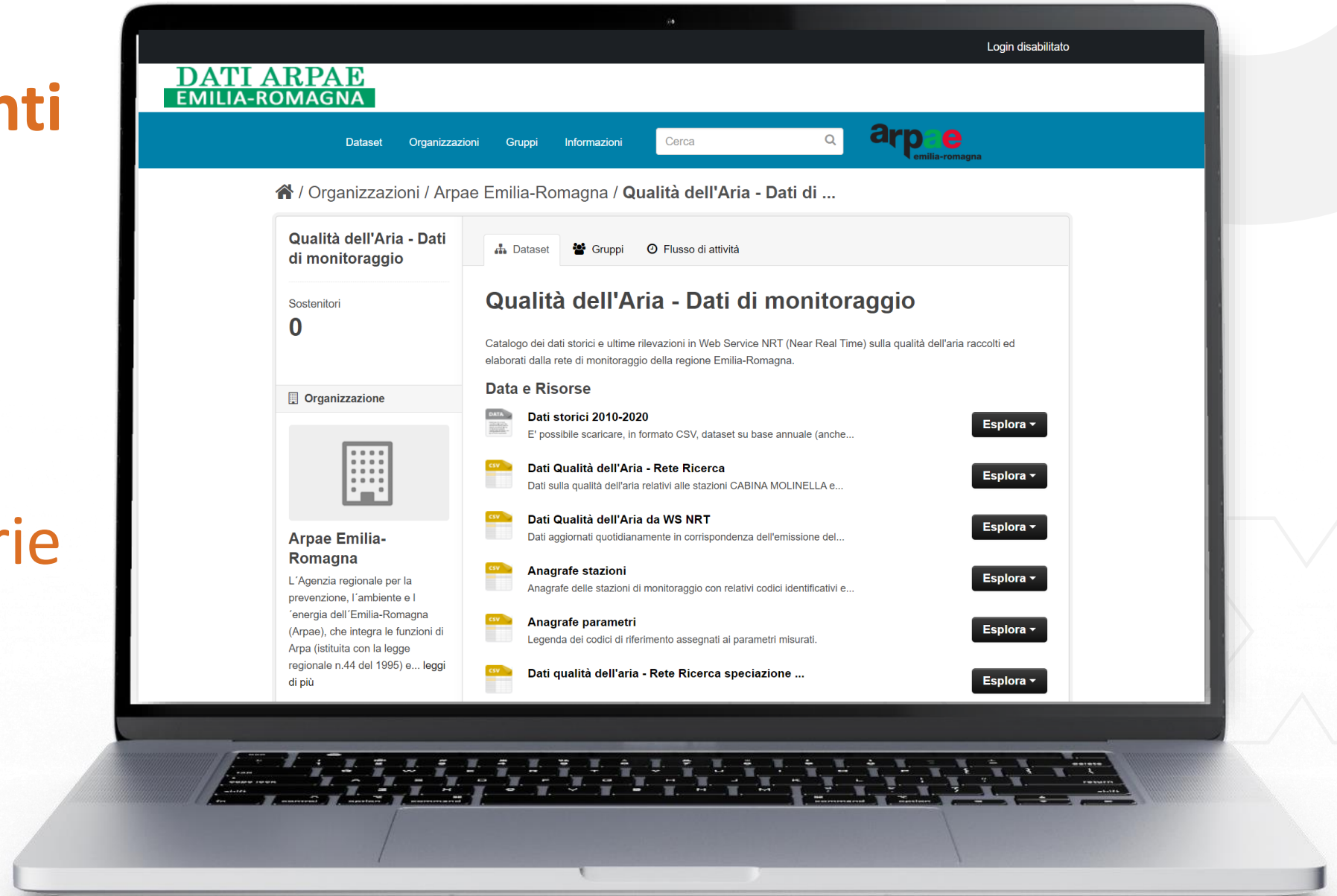
## OGC Standards

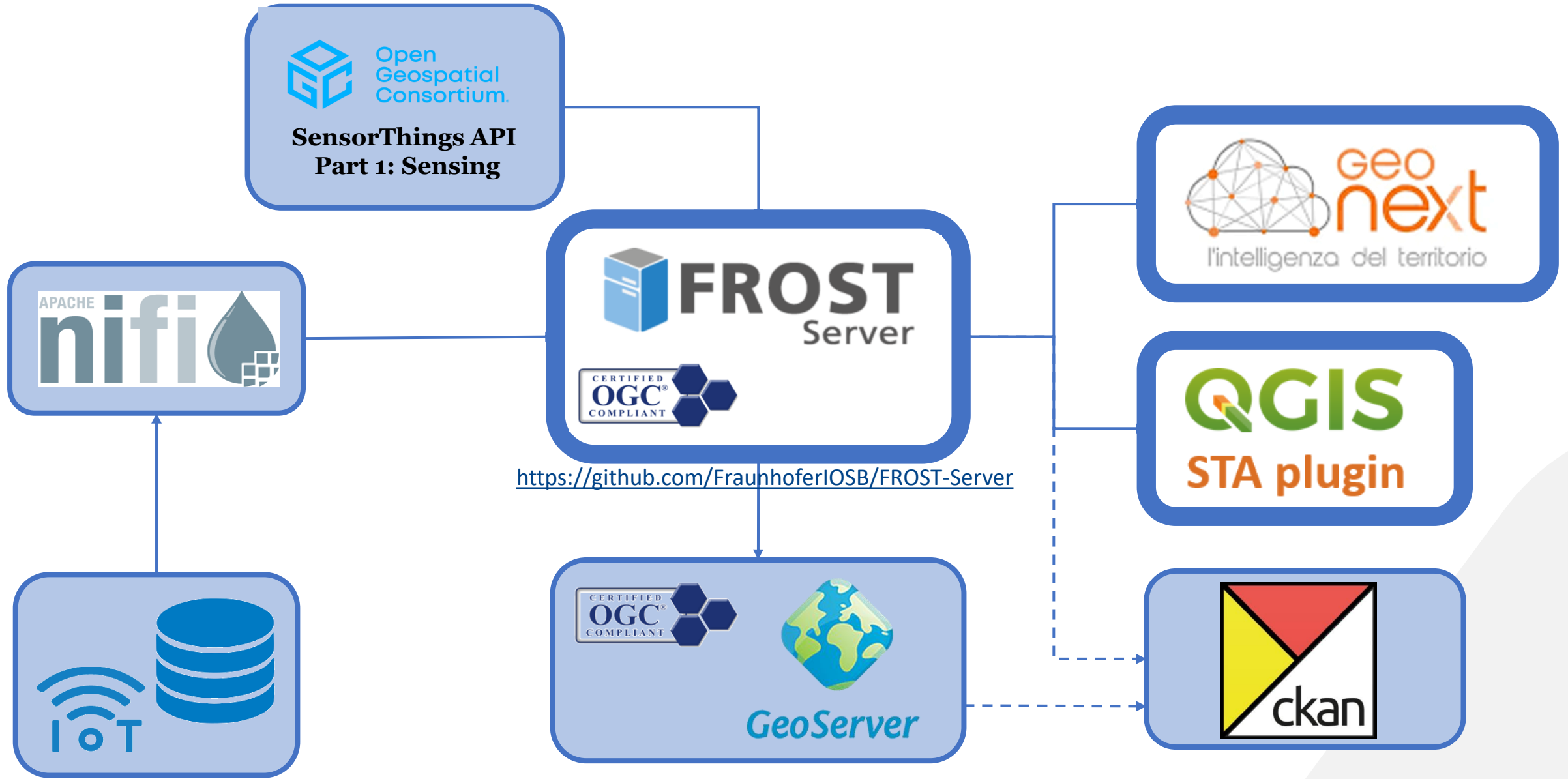
- [3D Tiles](#)
- [3dP](#)
- [ARML2.0](#)
- [Cat: ebRIM App Profile: Earth Observation Products](#)
- [Catalogue Service](#)
- [CDB](#)
- [CityGML](#)
- [CityJSON](#)
- [Coordinate Transformation](#)
- [EO-GeoJSON](#)
- [Filter Encoding](#)
- [GML in JPEG 2000](#)
- [GeoAPI](#)
- [GeoPackage](#)
- [GeoSciML](#)



# Raccolta dati dinamici da fonti eterogenee:

- API Socrata
- API CKAN
- API MDS
- API proprietarie
- portali web
- folder GDrive




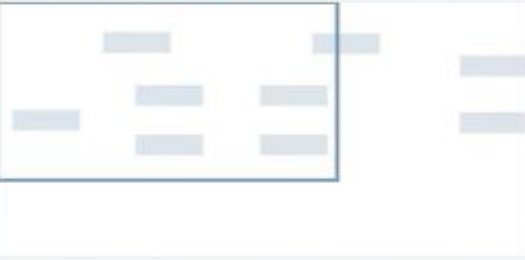


# Architettura




**Navigate**








**Operate**

 **API Wrapper FROST**  
Process Group

ce3d18e3-9550-396f-080b-0a32feb86812





 **HandleHttpRequest**  
HandleHttpRequest 1.14.0  
org.apache.nifi - nifi-standard-nar


In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	3,010 / 00:00:06.399	5 min

 **InvokeHTTP**  
InvokeHTTP 1.14.0  
org.apache.nifi - nifi-standard-nar


In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	0 / 00:00:00.000	5 min

Name success  
Queued 0 (0 bytes)

Name success  
Queued 0 (0 bytes)

 **UpdateAttribute**  
UpdateAttribute 1.14.0  
org.apache.nifi - nifi-update-attribute-nar

In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	0 / 00:00:00.000	5 min

 **UpdateAttribute**  
UpdateAttribute 1.14.0  
org.apache.nifi - nifi-update-attribute-nar

In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	0 / 00:00:00.000	5 min

Name success  
Queued 0 (0 bytes)

 **Set Parameters**  
UpdateAttribute 1.14.0  
org.apache.nifi - nifi-update-attribute-nar

In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	0 / 00:00:00.000	5 min

Name success  
Queued 0 (0 bytes)

 **UpdateAttribute**  
UpdateAttribute 1.14.0  
org.apache.nifi - nifi-update-attribute-nar

In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	0 / 00:00:00.000	5 min

Name success  
Queued 0 (0 bytes)

 **UpdateAttribute**  
UpdateAttribute 1.14.0  
org.apache.nifi - nifi-update-attribute-nar

In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	0 / 00:00:00.000	5 min

Name success  
Queued 0 (0 bytes)



# FROST-Server

Maven Build **passing**

code quality **A**

docker pulls **1.9M**



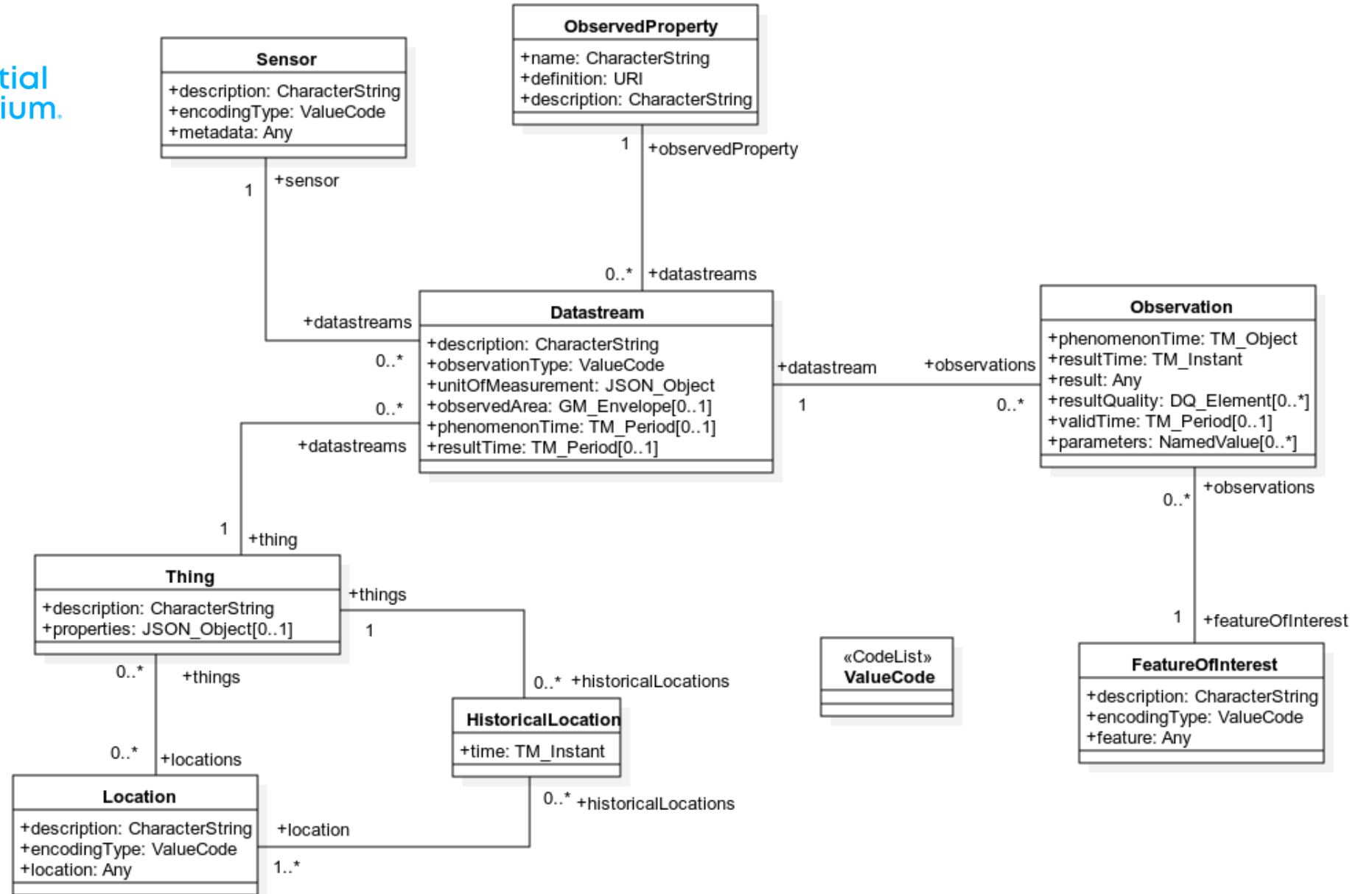
A Server implementation of the OGC SensorThings API. The **F**Raunhofer **O**pensource **S**ensor**T**hings-**S**erver is the first complete, open-source implementation of the OGC SensorThings API Part 1: Sensing. It now also includes preliminary actuation support.

Dati dinamici (Ferrara):

- 173 stazioni qualità aria ufficiali (Emilia-Romagna, Lombardia, Veneto)
- 14 centraline qualità aria sperimentali (Air-Break)
- 282 spire fisse monitoraggio traffico regionale
- 277 postazioni radar mobile per rilievo traffico comunale
- 21 spire fisse contabici (provincia)
- 6 sensori di presenza connessioni WiFi
- 45 *centraline low-cost misurazione PM, CO2 (da maggio)*

<https://github.com/FraunhoferIOSB/FROST-Server>

<https://iot.comune.fe.it/FROST-Server/v1.1/>





# <https://iot.comune.fe.it/FROST-Server/v1.1/>

The screenshot shows a web browser window with the address bar containing the URL <https://iot.comune.fe.it/FROST-Server/v1.1/>. The browser's developer tools are open, displaying the JSON response. The response is a list of 9 objects, each with a 'name' and a 'url' property. The objects are:

- 0: name: "Datastreams", url: "https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams"
- 1: name: "MultiDatastreams", url: "https://iot.comune.fe.it/FROST-Server/v1.1/MultiDatastreams"
- 2: name: "FeaturesOfInterest", url: "https://iot.comune.fe.it/FROST-Server/v1.1/FeaturesOfInterest"
- 3: name: "HistoricalLocations", url: "https://iot.comune.fe.it/FROST-Server/v1.1/HistoricalLocations"
- 4: name: "Locations", url: "https://iot.comune.fe.it/FROST-Server/v1.1/Locations"
- 5: name: "Observations", url: "https://iot.comune.fe.it/FROST-Server/v1.1/Observations"
- 6: name: "ObservedProperties", url: "https://iot.comune.fe.it/FROST-Server/v1.1/ObservedProperties"
- 7: name: "Sensors", url: "https://iot.comune.fe.it/FROST-Server/v1.1/Sensors"
- 8: name: "Things", url: ""

# <https://iot.comune.fe.it/FROST-Server/v1.1/Locations>

iot.comune.fe.it/FROST-Server/v1.1/ X iot.comune.fe.it/FROST-Server/v1.1/ X +

← → ↻ 🏠 🔒 https://iot.comune.fe.it/FROST-Server/v1.1/Locations ☆ 🛡️ ⬇️ ☰

JSON Dati non elaborati Header

Salva Copia Comprimi tutto Espandi tutto (lento) 📄 Filtra JSON

```
▼ value:  
  ▶ 0: {}  
  ▶ 1: {}  
  ▼ 2:  
    description: "quota: 59m, Lombardia"  
    encodingType: "application/vnd.geo+json"  
    @iot.id: "aq_prepair_lombardia_IT1287A"  
    ▼ location:  
      type: "Point"  
      ▼ coordinates:  
        0: 9.69814824935254  
        1: 45.1593728023411  
      name: "Codogno - via Trento"  
      ▶ properties: {}  
      ▶ @iot.selfLink: "https://iot.comune.fe.it..pair_Lombardia_IT1287A'"  
      ▶ HistoricalLocations@iot.navigationLink: "https://iot.comune.fe.it..7A')/HistoricalLocations"  
      ▶ Things@iot.navigationLink: "https://iot.comune.fe.it..mbardia_IT1287A')/Things"  
    ▶ 3: {}  
    ▶ 4: {}  
    ▶ 5: {}  
    ▶ 6: {}  
    ▶ 7: {}  
    ▶ 8: {}  
    ▶ 9: {}  
    ▶ 10: {}  
    ▶ 11: {}  
    ▶ 12: {}
```

# <https://iot.comune.fe.it/FROST-Server/v1.1/Locations/.../Things>

```
value:  
  0:  
    description: "tipo: Traffic, zona: Urban"  
    @iot.id: "aq_prepair_lombardia_IT1287A"  
    name: "Stazione IT1287A"  
    properties:  
      organization: "aq_prepair_lombardia"  
    @iot.selfLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Things('aq_prepair_Lombardia_IT1287A')"  
    MultiDatastreams@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Things('aq_prepair_Lombardia_IT1287A')/MultiDatastreams"  
    Locations@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Things('aq_prepair_Lombardia_IT1287A')/Locations"  
    HistoricalLocations@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Things('aq_prepair_Lombardia_IT1287A')/HistoricalLocations"  
    TaskingCapabilities@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Things('aq_prepair_Lombardia_IT1287A')/TaskingCapabilities"  
    Datastreams@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Things('aq_prepair_Lombardia_IT1287A')/Datastreams"
```



# <https://iot.comune.fe.it/FROST-Server/v1.1/Locations/.../Datastreams>

```
value:
  0:
    description: "Ozono"
    @iot.id: "aq_prepair_lombardia_IT1287A_03"
    name: "O3"
    observationType: "http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement"
    properties:
      organization: "aq_prepair_lombardia"
      resultTime: null
    @iot.selfLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams('aq_prepair_lombardia_IT1287A_03')"
    unitOfMeasurement:
      name: null
      symbol: "µg/m³"
      definition: null
    Sensor@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams('aq_prepair_lombardia_IT1287A_03')/Sensor"
    Thing@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams('aq_prepair_lombardia_IT1287A_03')/Thing"
    Observations@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams('aq_prepair_lombardia_IT1287A_03')/Observations"
    ObservedProperty@iot.navigationLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams('aq_prepair_lombardia_IT1287A_03')/ObservedProperty"
  1:
    description: "Polveri sottili"
    @iot.id: "aq_prepair_lombardia_IT1287A_PM25"
    name: "PM2.5"
    observationType: "http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_Measurement"
    properties:
      organization: "aq_prepair_lombardia"
      resultTime: null
    @iot.selfLink: "https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams('aq_prepair_lombardia_IT1287A_PM25')"
```

# <https://iot.comune.fe.it/FROST-Server/v1.1/Locations/.../Observations>

The screenshot shows a web browser window with the URL `https://iot.comune.fe.it/FROST-Server/v1.1/Datastreams('aq_prepare_lombardia_IT2230A_NO2')/Observations`. The browser's developer tools are open to the JSON tab, displaying the following data:

```
JSON  Dati non elaborati  Header
Salva  Copia  Comprimi tutto  Espandi tutto (lento)  Filtra JSON
@iot.nextLink: "https://iot.comune.fe.it/.../Observations?skip=5000"
value:
  0:
    @iot.id: "701c6dbc-eebd-11eb-95dc-87aa8d315097"
    phenomenonTime: "2021-07-24T23:00:00.000Z"
    parameters: {}
    result: "14.4"
    resultTime: null
    @iot.selfLink: "https://iot.comune.fe.it...11eb-95dc-87aa8d315097'"
    MultiDatastream@iot.navigationLink: "https://iot.comune.fe.it...315097')/MultiDatastream"
    FeatureOfInterest@iot.navigationLink: "https://iot.comune.fe.it...5097')/FeatureOfInterest"
    Datastream@iot.navigationLink: "https://iot.comune.fe.it...7aa8d315097')/Datastream"
  1: {}
  2: {}
  3: {}
  4: {}
  5: {}
  6: {}
  7: {}
  8: {}
  9: {}
  10: {}
  11: {}
  12: {}
  13: {}
  14: {}
  15: {}
```

# Scaletta

- Contesto (da dove siamo partiti)
- Soluzioni e software
- Demo di dati dinamici da endpoint SensorThings
- 'Umanizzare' i dati dinamici



# GeoNext (DataCatalogue)

The screenshot displays the GeoNext Data Catalogue interface. The main page is titled "Gestione sorgente dati" and includes a sidebar with navigation options like "Opzioni utente", "Gestione dei dati", and "Amministrazione". The "Gestione dei dati" section is active, showing "Sorgenti dati" as the selected category. The main content area has a "Crea" button and input fields for "Nome\*", "Descrizione\*", and "Tipo\*". The "Tipo\*" dropdown menu is open, listing various data source types, with "SensorThingsAPI-STA" highlighted by a red box. Other options include API ODATA, ESRI SDE, ESRI Shapefile, Oracle database, PostgreSQL/PostGIS database, Raster, SqlServer database, Tile Map Service, Web Feature Service, and Web Map Service. On the right, a map window shows a location in Ferrara with a line graph of "Alta emissione della mobilità" data for August 5, 2022. The graph shows a peak around 11:00. The bottom of the interface shows a map with coordinates 1301224.1, 5596611.7 (EPSG:3857) (WGS84 / Pseudo - Mercator) and a scale of 1000 ft.

# GeoNext (Viewer)

The screenshot displays the GeoNext (Viewer) interface. At the top, the logo 'civilianext' is visible on the left, and the user 'p.cipriano' and location 'Ferrara' are shown on the right. A toolbar with various navigation and tool icons is positioned below the header. The main map area shows Ferrara, Italy, with a yellow circle highlighting a specific location. A pop-up window titled 'Postazione' provides details for 'CUS Ferrara' at 'Via Gramiccia 70, Ferrara'. Below this, a section titled 'Stazione LS0621020076 - tipo: Progetto AirBreak' lists 'Osservazioni disponibili' (available observations) in a table. The table includes columns for 'Nome', 'Descrizione', 'Date Rif.', 'Proprietà misurata', 'Sensore', and 'Osservazioni'. A sidebar on the right contains a 'Catalogo' section with 'Temi visualizzati' and 'Grafici' tabs, and a list of thematic areas under 'Aree tematiche', including 'AIR BREAK' and 'Aria'.

**Postazione**

**CUS Ferrara**  
Via Gramiccia 70, Ferrara

**Stazione LS0621020076 - tipo: Progetto AirBreak**

Osservazioni disponibili

Nome	Descrizione	Date Rif.	Proprietà misurata	Sensore	Osservazioni
PM2.5-h	Polveri sottili (me...	✓ 17 Sep 2021 - 19	PM2.5-h - µg/m³	(p) LabService ...	
PM10-h	Polveri sottili (me...	✓ 17 Sep 2021 - 19	PM10-h - µg/m³	(p) LabService ...	
T	Temperatura	✓ 17 Sep 2021 - 19	T - °C	(p) LabService ...	
Pr	Pressione	✓ 17 Sep 2021 - 19	Pr - hPa	(p) LabService ...	
O3	Ozono	✓ 17 Sep 2021 - 19	O3 - µg/m³	(p) LabService ...	
NO2	Biossido di azoto	✓ 17 Sep 2021 - 19	NO2 - µg/m³	(p) LabService ...	
VOC	Composti organi...	✓ 17 Sep 2021 - 19	VOC - µg/m³	(p) LabService ...	
RH	Umidità relativa	✓ 17 Sep 2021 - 19	RH - %	(p) LabService ...	
CO	Monossido di car...	✓ 17 Sep 2021 - 19	CO - mg/m³	(p) LabService ...	

**Catalogo** | Temi visualizzati | Grafici

**Aree tematiche**

- AIR BREAK
- Aria
  - Aree pilota
  - Centraline Air Break inattive
  - Centraline AIR BREAK (p)
  - Stazioni ARPA Veneto (p)
  - Stazioni ARPAE ER private (p)
  - Stazioni ARPAE ER (p)
  - Stazioni ARPA Lombardia (p)
- Mobilità air friendly
- Mobilità alta emissione
  - Stima flussi di traffico
  - Flussi traffico RER Nuovo (p)
  - Rilievi traffico Comune cluster (p)
  - Rilievi traffico Comune (p)
  - Flussi traffico RER (p)
- Verde urbano

# GeoNext (Viewer)





# QGIS plugin STA

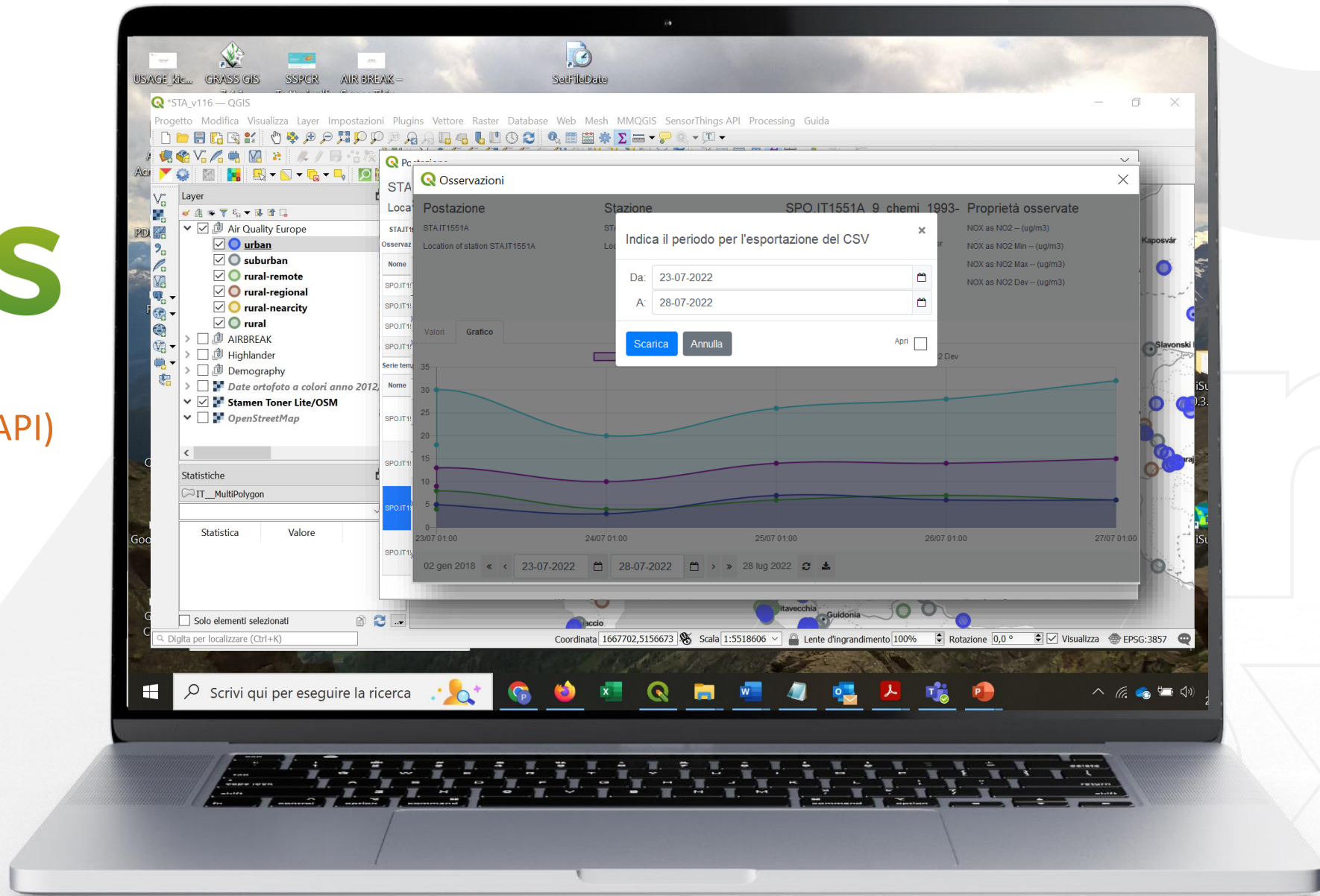
QGIS interface showing the STA plugin. The main map displays several monitoring stations as green circles. A pop-up window titled "Osservazioni" shows a time-series graph for CO concentration at the "Corso Isonzo" station from September 2021 to January 2023. The graph shows a clear daily cycle with peaks around 0.6-0.7 mg/m³ and troughs around 0.1 mg/m³. The interface includes a menu bar, toolbar, layer list, and status bar.

Nome	Desc
T	Temp
Pr	Press
RH	Umid
CO	Mon
NO2	Bioss
PM10-h	Polve
PM2.5-h	Polve
VOC	Comp
O3	Ozon

Postazione: Corso Isonzo  
Stazione: Corso Isonzo  
CO: Monossido di carbonio  
17 set 2021 - 31 gen 2023  
LabService Analytica (mg/m³)



## plugin STA (SensorThings API)





Layer

- AQ EEEA
- ComuneFE
- Stamen Toner Lite/OSM**

Statistiche

▼

▼

Statistica	Valore

Solo elementi selezionati



Q Digita per localizzare (Ctrl+K)

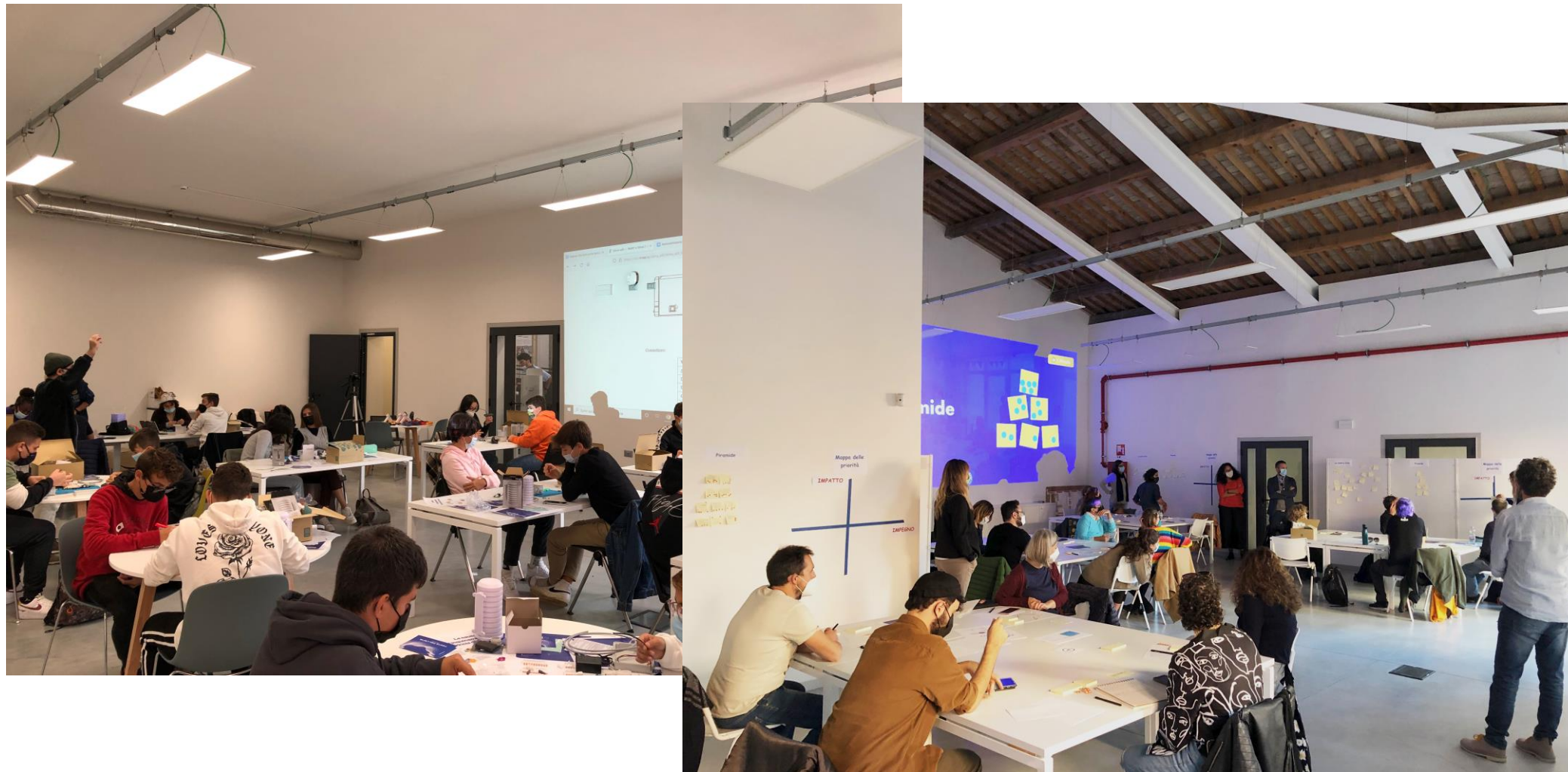
Coordinata -94888,8514086 Scala :40604028 Lente d'ingrandimento 100% Rotazione 0,0 ° Visualizza EPSG:3857

# Scaletta

- Contesto (da dove siamo partiti)
- Soluzioni e software
- Demo di dati dinamici da endpoint SensorThings
- 'Umanizzare' i dati dinamici



# Umanizzare i dati dinamici



- *Umanizzare i dati di qualità dell'aria* (workshop Festa dell'aria 2021)
- coinvolgimento di studenti e docenti UniFerrara, istituti superiori, attivisti di associazioni ambientali, tecnici di Comune e ARPAE, partner di progetto
- progettazione UX/UI

<https://airbreakferrara.net/che-aria-tira/>

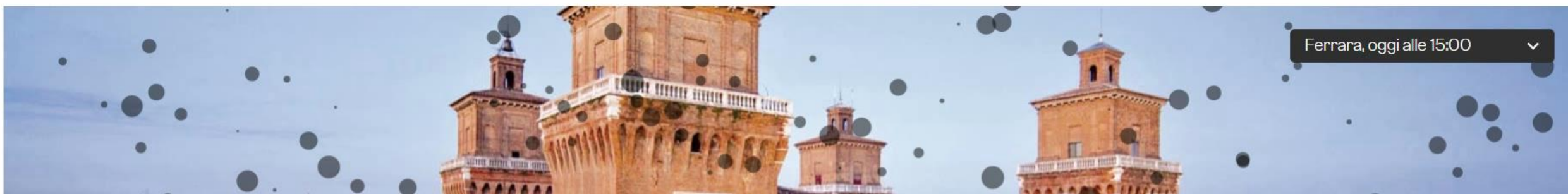


## Che aria tira?

Vuoi conoscere la qualità dell'aria che respiri?

Osserva le particelle che fluttuano nell'aria: rappresentano gli inquinanti che le centraline del progetto europeo Air Break stanno rilevando.

Scegli di  Vedere  Non vedere  l'inquinamento



# Grazie

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