

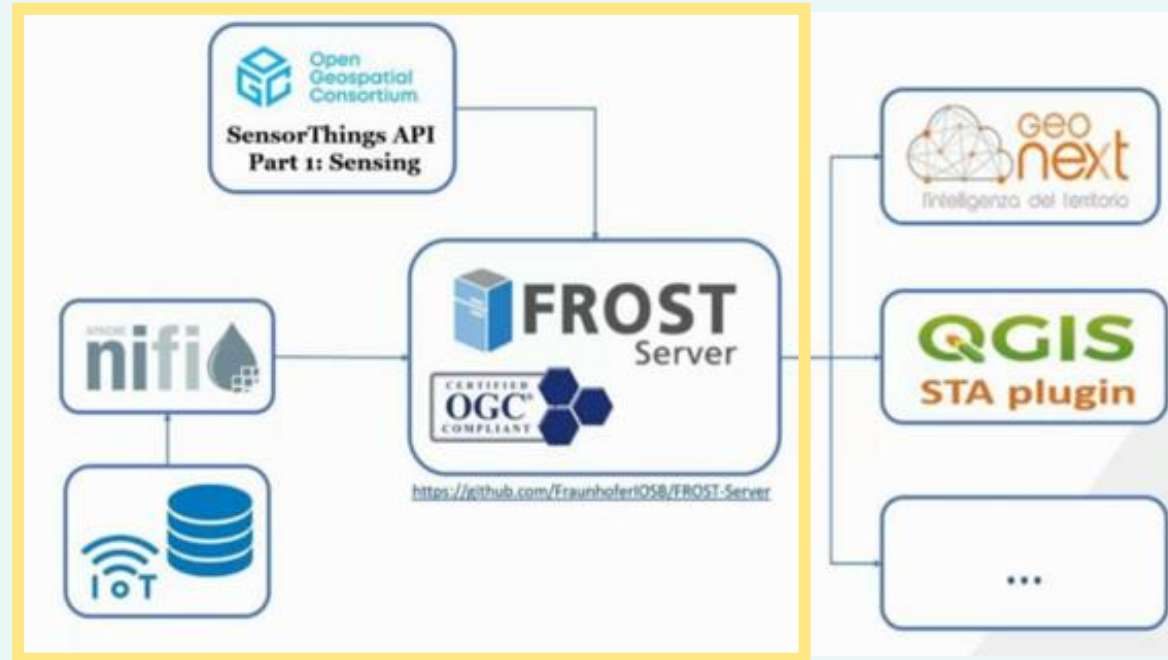
04 – QGIS plugin for STA data visualization

Beatrice Olivari



This project has received funding from the European Union's HE research and innovation programme under the grant agreement No. 101057497

Architecture



PREVIOUSLY ON
~~THE SIMPSONS~~
EDIAQI

Previously on ... EDIAQI

SensorThings API

Thanks to the way SensorThings API was built...



Web browser navigation

...data from the API can be easily viewed using a **normal Web Browser**. One can simply navigate from one object to the next by clicking the **URLs** provided within the data.

How?

ENDPOINT

<https://airquality-frost.k8s.ilt-dmz.iosb.fraunhofer.de/v1.1/Observations>

Data from the endpoint



```

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```

Data from the endpoint



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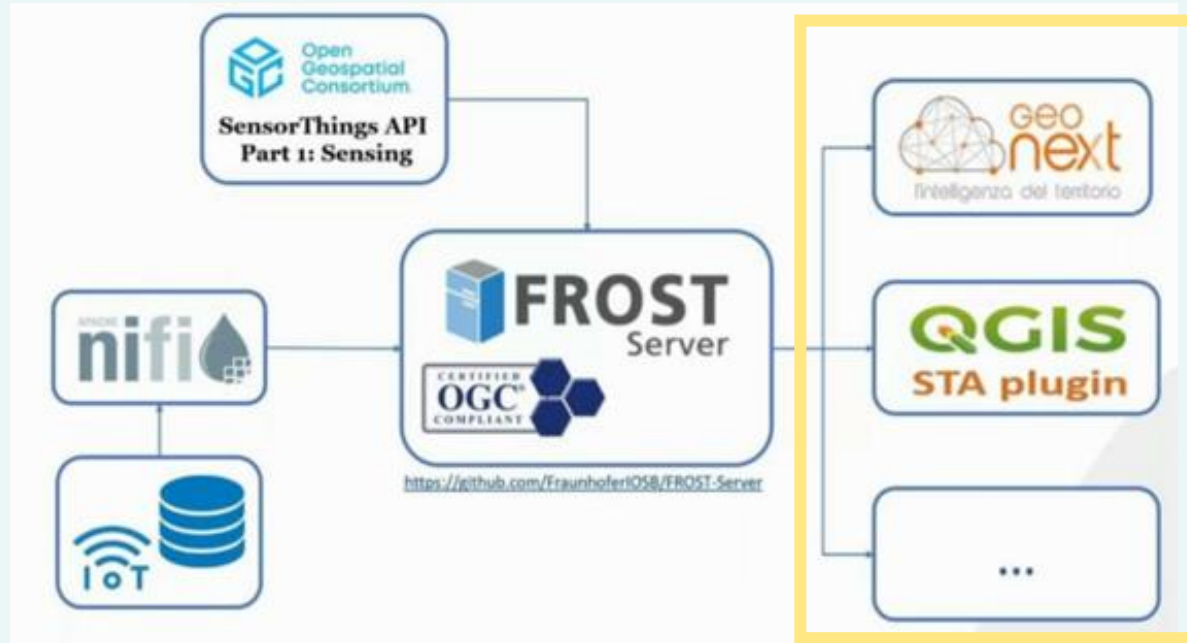


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(3)"
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```

FROST data visualization












civiliannext

Postazione

CUS Ferrara
Via Gramicia 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 ...	

Visualizza osservazioni

Catalogo

Temi visualizzati

Grafici

- Terrestri BW
- Openstreemap

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

1 km
1 mi

1294279.1, 5597235.7 (EPSG:3857) (WGS84 / Pseu

OpenStreetMap

GeoNext

The screenshot displays the GeoNext web application interface. On the left, a map shows the location of the station in Ferrara, Italy, near Via Gramiccia 70. The main content area is a data table for PM2.5 measurements. The table has two columns: 'Tempo' (Time) and 'Valore (µg/m³)' (Value). The data is for the date 19/04/2023, with measurements taken every hour from 08:00:00 to 17:00:00. The values range from 2.4 to 7.8 µg/m³. The interface includes navigation controls for the data table, such as 'Page 1 of 100' and 'Items 1 - 10 of 1000'. A yellow circle highlights the 'Aggiorna' (Refresh) button in the bottom right corner of the data table area. The top of the interface shows the 'civilianext' logo and navigation icons. The right side of the interface has a sidebar with various options, including 'Grafici' (Charts) and 'Verde urbano' (Urban Green).

Postazione: CUS Ferrara
Via Gramiccia 70, Ferrara

Stazione: Stazione LS0621020076
tipo: Progetto AirBreak

PM2.5-h
Polveri sottili (media oraria)
✓ 17 Sep 2021 - 19 Apr 2023
(p) LabService Analytica (µg/m³)

Tempo	Valore (µg/m³)
19/04/2023 17:00:00	2.8
19/04/2023 16:00:00	2.4
19/04/2023 15:00:00	2.4
19/04/2023 14:00:00	3.6
19/04/2023 13:00:00	4.6
19/04/2023 12:00:00	5.1
19/04/2023 11:00:00	5
19/04/2023 10:00:00	4.6
19/04/2023 09:00:00	5.2
19/04/2023 08:00:00	7.8

Page 1 of 100 | Items 1 - 10 of 1000

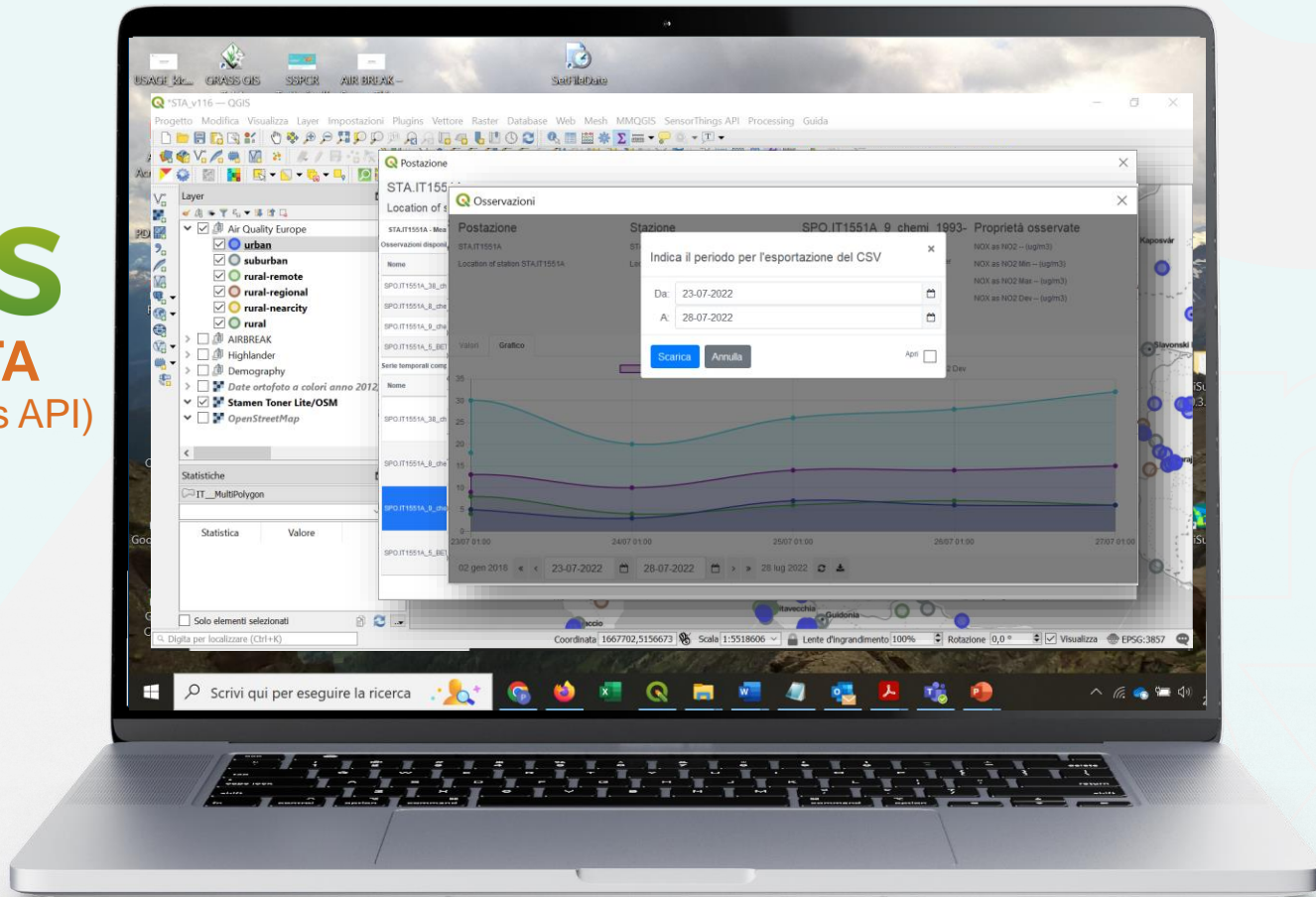
Ultimi 1000 dati | 17 Sep 2021 | 09-03-2023 | 19-04-2023 | 19 Apr 2023

Aggiorna

Verde urbano

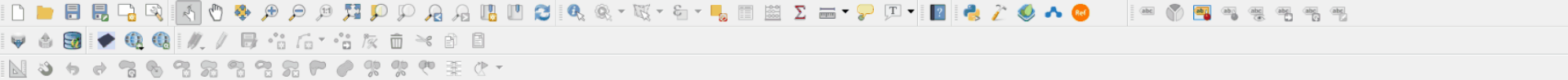
QGIS

plugin STA (SensorThings API)





QGIS is a free and open-source cross-platform desktop GIS application that supports **viewing, editing, printing, and analysis of geospatial data**



Layers Panel

- gls.osm_1
- osm_road
- gls.osm_1

Panels

- QGIS Cloud
- Toolbox Ctrl+Alt+T
- Advanced Digitizing Panel
- Browser Panel
- Browser Panel (2)
- GPS Information Panel**
- Layer Order Panel
- Layer Styling
- Layers Panel
- Log Messages Panel
- Overview Panel
- Search QMS
- Spatial Bookmarks Panel
- Statistics Panel
- Tile Scale Panel
- Undo/Redo Panel
- User Input Panel

Toolbars

- Advanced Digitizing Toolbar
- Attributes Toolbar
- Database Toolbar
- Digitizing Toolbar
- Help Toolbar
- Label Toolbar
- Manage Layers Toolbar
- Map Navigation Toolbar
- Plugins Toolbar
- Project Toolbar
- Raster Toolbar
- Vector Toolbar
- Web Toolbar



Layer Styling

gis.osm_places_free_1

Categorized

Column: abc fclass

Symbol: Change

Color ramp: Random colors

Symbol	Value	Legend
	city	city
	farm	farm
	hamlet	hamlet
	island	island
	locality	locality
	national_capital	national_capital
	region	region
	suburb	suburb
	town	town
	village	village

Classify Delete all

Layer rendering

Layer transparency:

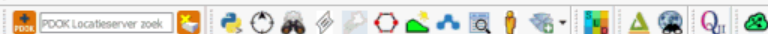
Layer blending mode: Normal

Feature blending mode: Normal

Draw effects

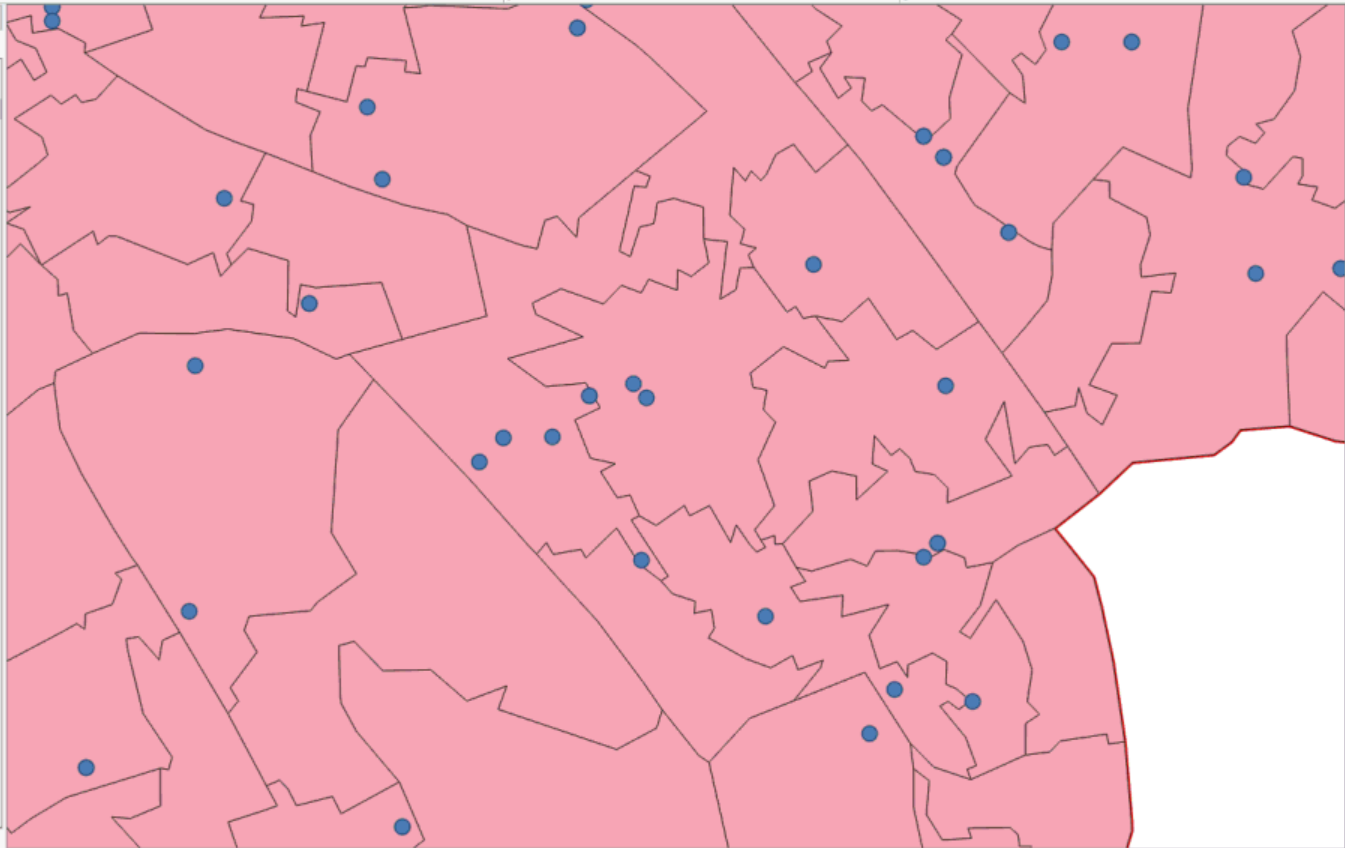
Control feature rendering order

Live update Apply



Layers

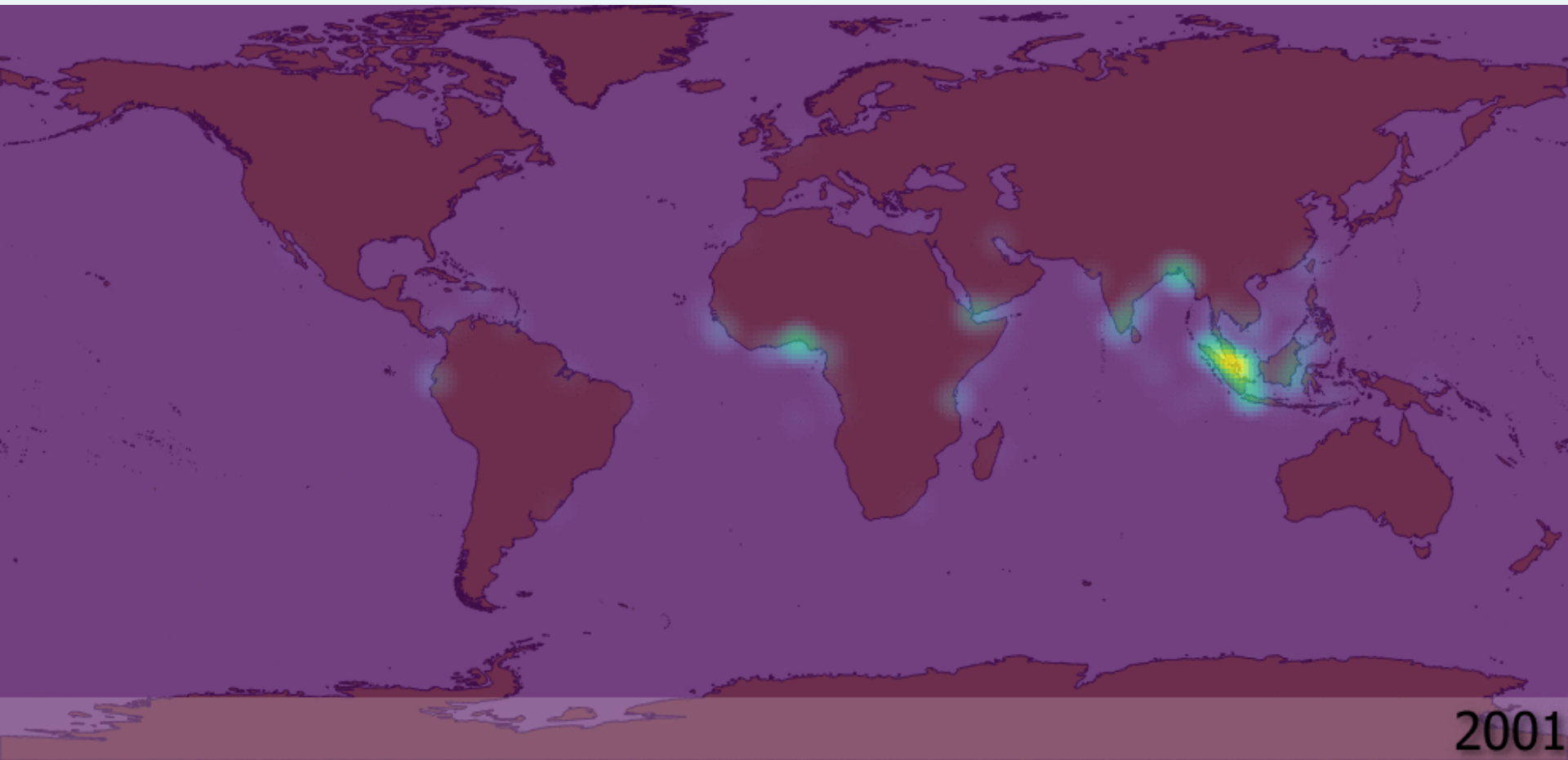
- PostGIS Planning Apps - TryMapThat
 - planningapps4326
 - grass_verges
 - schools4326
 - lcc_isoa_liverpool_4326
- PostGIS - TryMapThat
 - cartographic-symbol
 - cartographic-text
 - topographic-area
 - topographic-line
 - topographic-point
 - lcc_bndy



Processing Toolbox

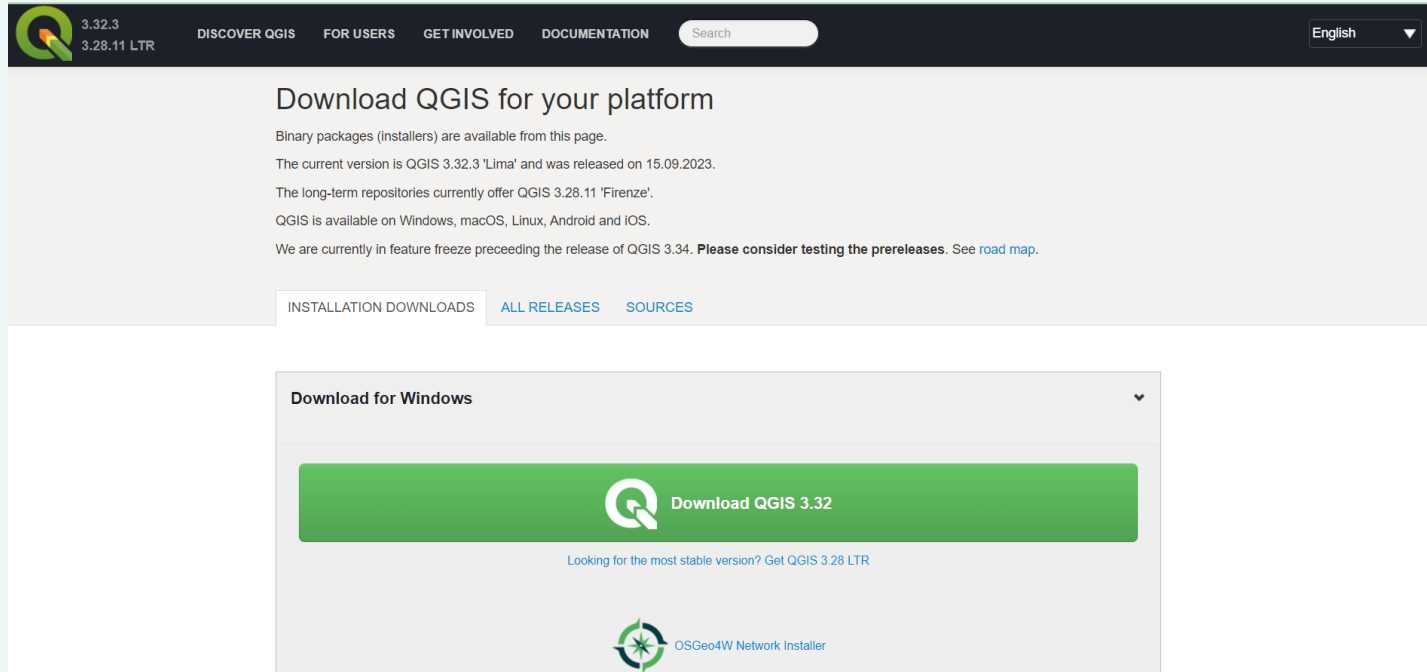
Search

- Recently used
- Cartography
- Database
- File tools
- Graphics
- Interpolation
- Layer tools
- Network analysis
- Raster analysis
- Raster terrain analysis
- Raster tools
- Vector analysis
- Vector creation
- Vector general
- Vector geometry
- Vector overlay
- Vector selection
- Vector table
- GDAL
- GRASS
- SAGA



2001

Download of QGIS



The screenshot shows the QGIS website's download page. At the top, there is a navigation bar with the QGIS logo, version information (3.32.3 and 3.28.11 LTR), and links for 'DISCOVER QGIS', 'FOR USERS', 'GET INVOLVED', and 'DOCUMENTATION'. A search bar and a language dropdown set to 'English' are also present. The main heading is 'Download QGIS for your platform'. Below this, there are several paragraphs of text: 'Binary packages (installers) are available from this page.', 'The current version is QGIS 3.32.3 'Lima' and was released on 15.09.2023.', 'The long-term repositories currently offer QGIS 3.28.11 'Firenze'.', 'QGIS is available on Windows, macOS, Linux, Android and iOS.', and 'We are currently in feature freeze preceding the release of QGIS 3.34. Please consider testing the prereleases. See [road map](#).' Below the text are three tabs: 'INSTALLATION DOWNLOADS' (selected), 'ALL RELEASES', and 'SOURCES'. The 'Download for Windows' section is expanded, showing a large green button with the QGIS logo and the text 'Download QGIS 3.32'. Below the button, there is a link: 'Looking for the most stable version? Get QGIS 3.28 LTR'. At the bottom of this section is the 'OSGeo4W Network Installer' logo and text.

3.32.3
3.28.11 LTR

DISCOVER QGIS FOR USERS GET INVOLVED DOCUMENTATION Search English

Download QGIS for your platform

Binary packages (installers) are available from this page.

The current version is QGIS 3.32.3 'Lima' and was released on 15.09.2023.


The long-term repositories currently offer QGIS 3.28.11 'Firenze'.

QGIS is available on Windows, macOS, Linux, Android and iOS.


We are currently in feature freeze preceding the release of QGIS 3.34. **Please consider testing the prereleases.** See [road map](#).

INSTALLATION DOWNLOADS ALL RELEASES SOURCES

Download for Windows

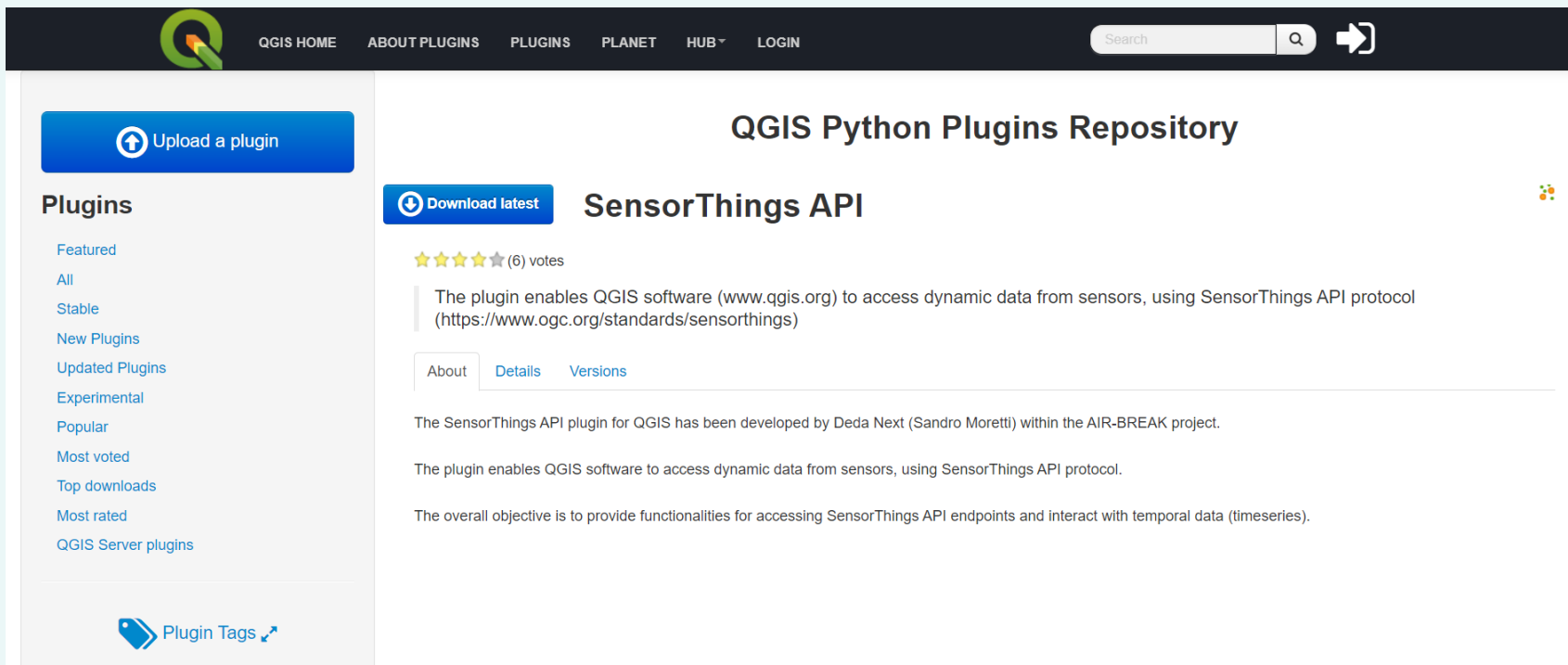
 Download QGIS 3.32

Looking for the most stable version? Get QGIS 3.28 LTR

 OSGeo4W Network Installer

<https://www.qgis.org/en/site/forusers/download.html>

QGIS Python Plugin



The screenshot shows the QGIS Python Plugins Repository interface. At the top, there is a navigation bar with links for QGIS HOME, ABOUT PLUGINS, PLUGINS, PLANET, HUB, and LOGIN, along with a search bar and a right-pointing arrow. On the left side, there is a sidebar with a blue button labeled "Upload a plugin" and a "Plugins" section containing a list of categories: Featured, All, Stable, New Plugins, Updated Plugins, Experimental, Popular, Most voted, Top downloads, Most rated, and QGIS Server plugins. At the bottom of the sidebar is a "Plugin Tags" icon. The main content area is titled "QGIS Python Plugins Repository" and features a "Download latest" button. The plugin being displayed is "SensorThings API", which has a 5-star rating based on 6 votes. The description states: "The plugin enables QGIS software (www.qgis.org) to access dynamic data from sensors, using SensorThings API protocol (https://www.ogc.org/standards/sensorthings)". Below the description are tabs for "About", "Details", and "Versions". The "About" tab is active, showing text that credits the development to Deda Next (Sandro Moretti) within the AIR-BREAK project, explains the plugin's purpose, and states the overall objective of providing functionalities for accessing SensorThings API endpoints and interacting with temporal data (timeseries).

<https://plugins.qgis.org/plugins/SensorThingsAPI/>
https://github.com/AirBreak-UIA/SensorThingsAPI_QGIS-plugin

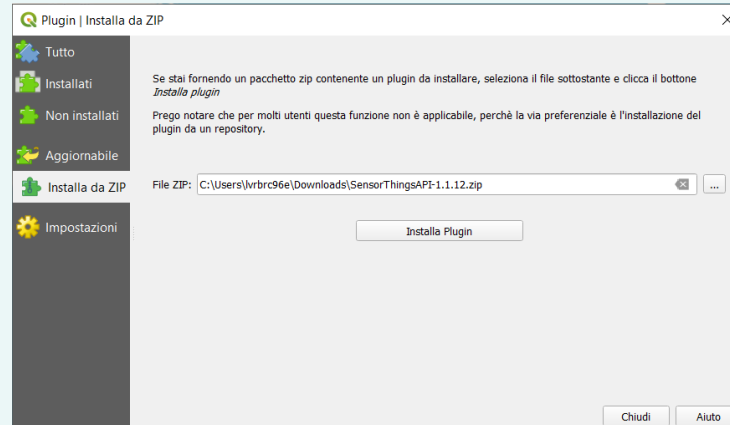
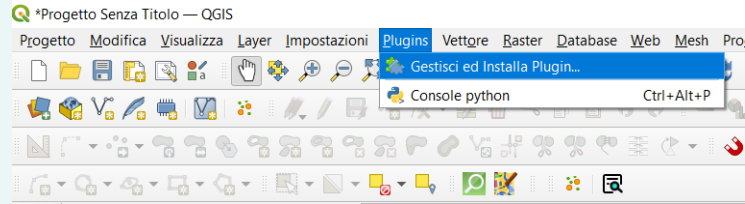
QGIS Python Plugin

Download ZIP

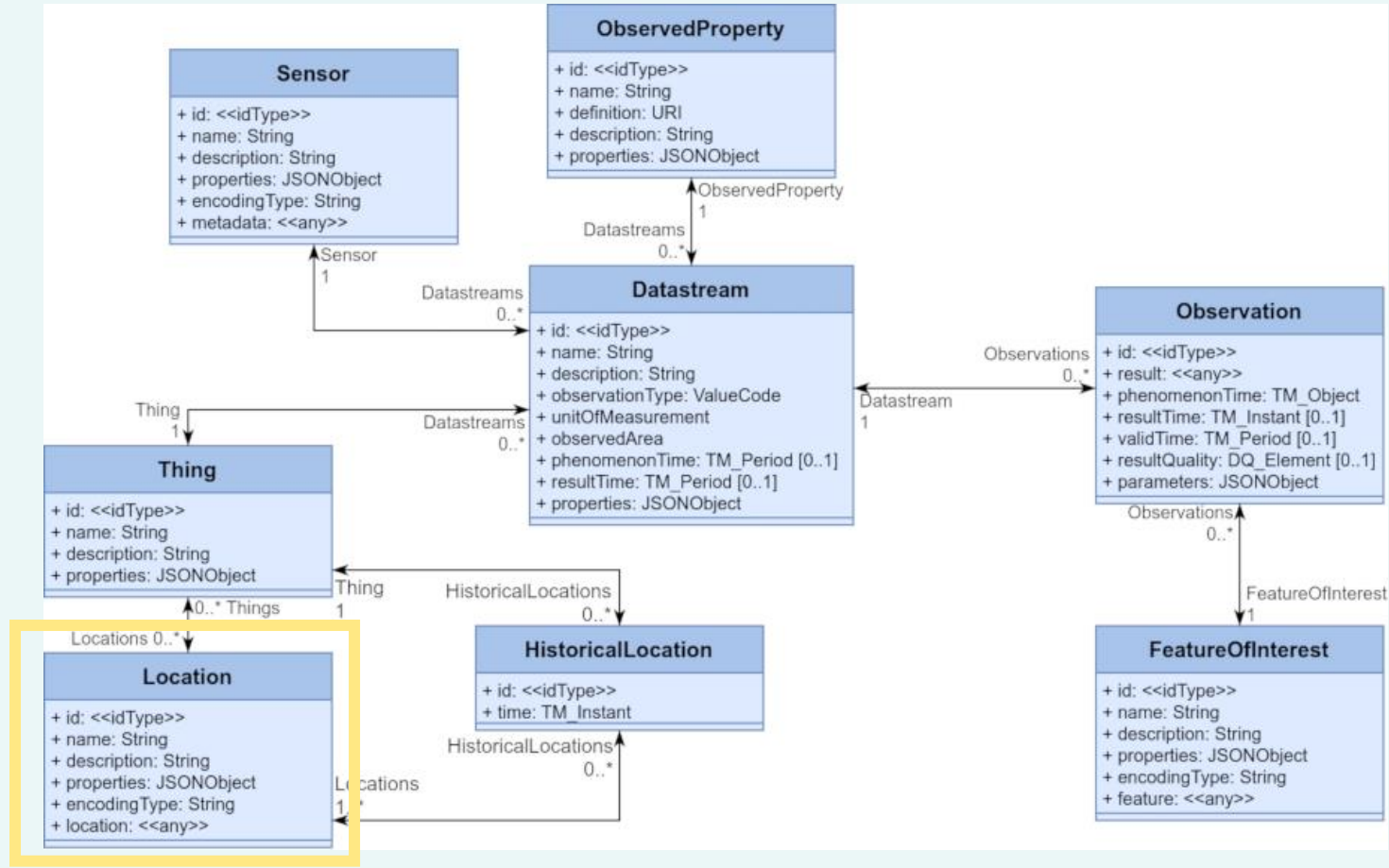
<https://plugins.qgis.org/plugins/SensorThingsAPI/>



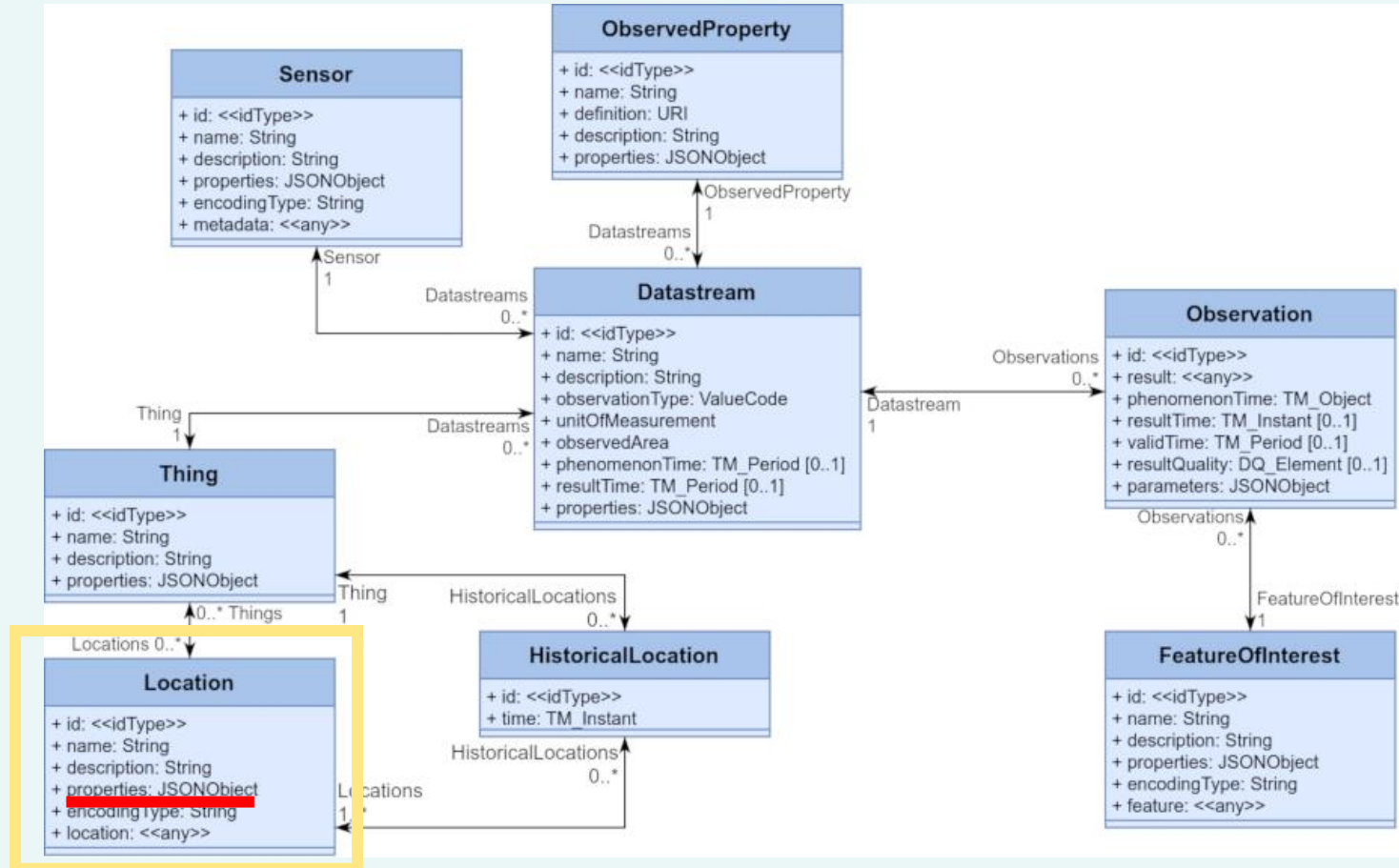
Plugin tab on QGIS



FROST Data Model



FROST Data Model



Layer

- Stamen Toner Lite/OSM





Layer

- Stamen Toner Lite/OSM

SensorThings API - Carica livello da server remoto

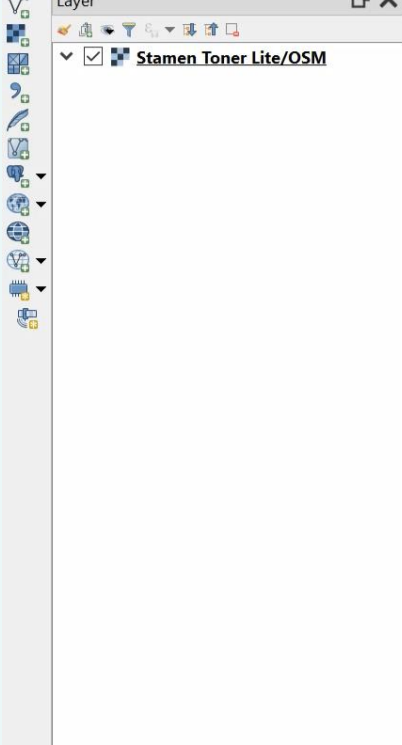
- Agenzia Ambientale NL
- Air Quality Fraunhofer**
- BGS UK
- BRGM Ground water quantity
- BRGM Surface water quantity
- Comune di Ferrara
- Covid STA
- Demography Fraunhofer
- Dutch 1.0 portal

Opzioni

Singolo livello postazioni Estensione mappa

Chiudi Aggiungi Aggiungi tutti

Coordinate: 639143,10190952 Scala: 73087248 Lente d'ingrandimento: 100% Rotazione: 0,0° Visualizza EPSG:857



SensorThings API - Carica livello da server remoto

Air Quality Fraunhofer

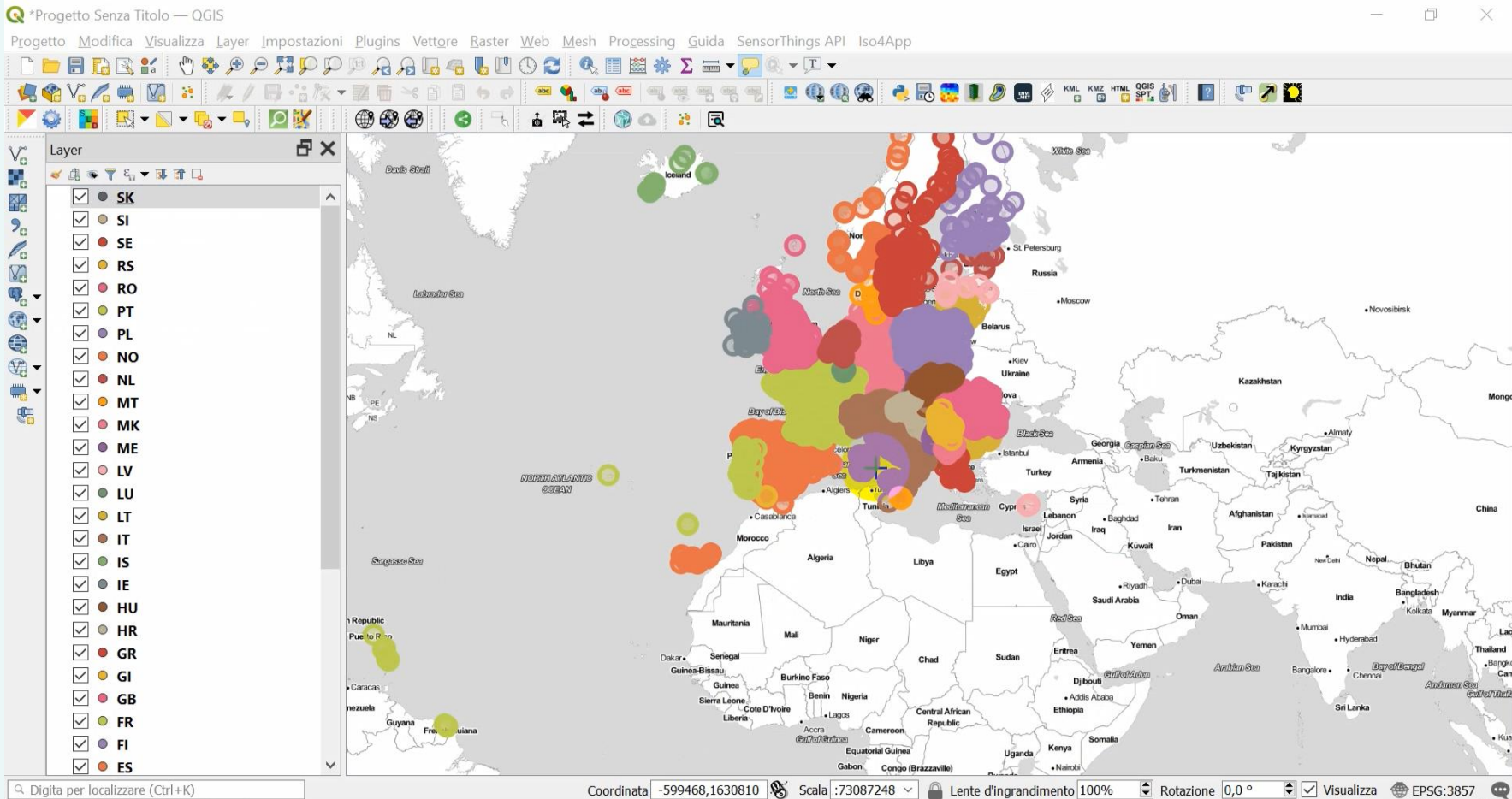
Connetti Nuova Modifica Rimuovi

Gruppo	Proprietà	Conteggio
DE	countryCode	702/4944
DK	countryCode	14/4944
EE	countryCode	9/4944
ES	countryCode	655/4944
FI	countryCode	68/4944
FR	countryCode	631/4944
GB	countryCode	173/4944
GI	countryCode	3/4944
GR	countryCode	31/4944
HR	countryCode	26/4944

Opzioni

Singolo livello postazioni Estensione mappa

Chiudi Aggiungi **Aggiungi tutti**





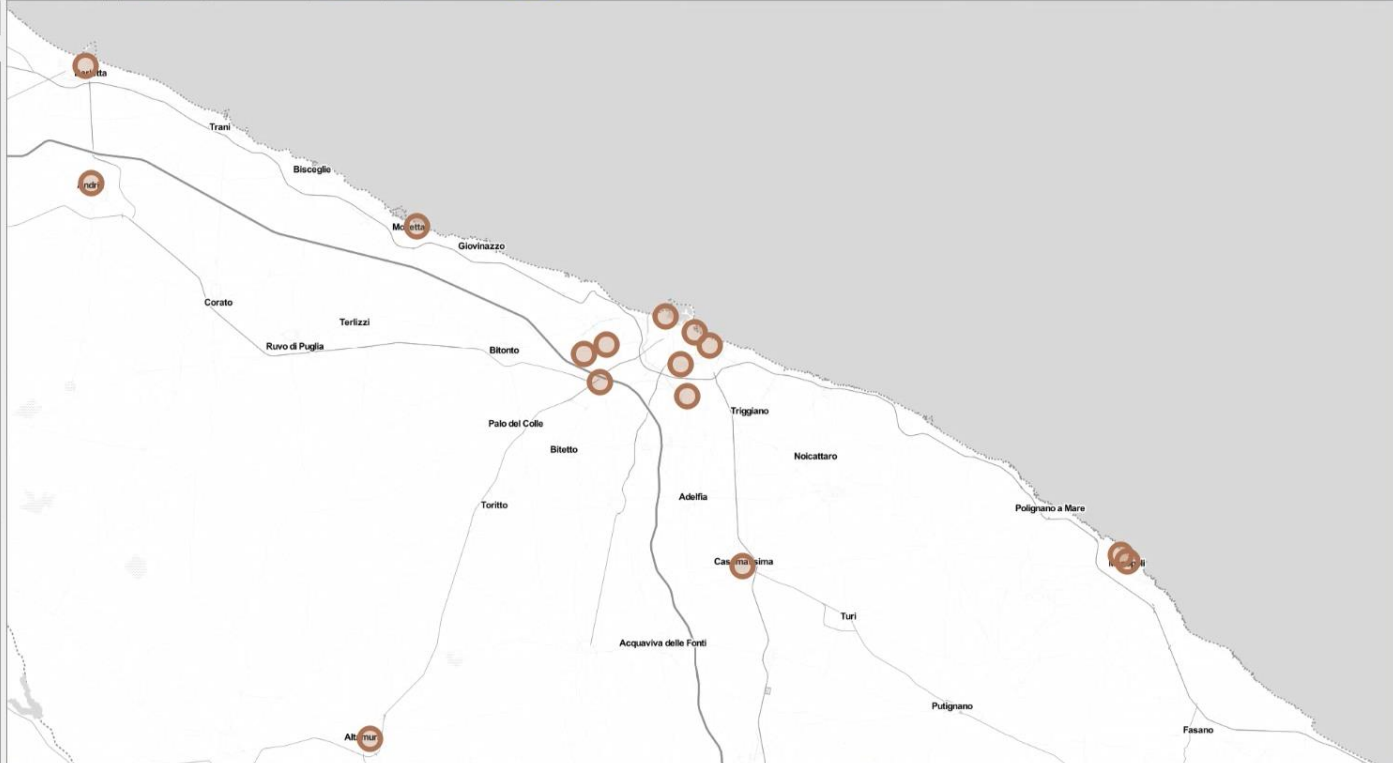
Carica livello da server remoto

Mostra informazioni di una postazione



Layer

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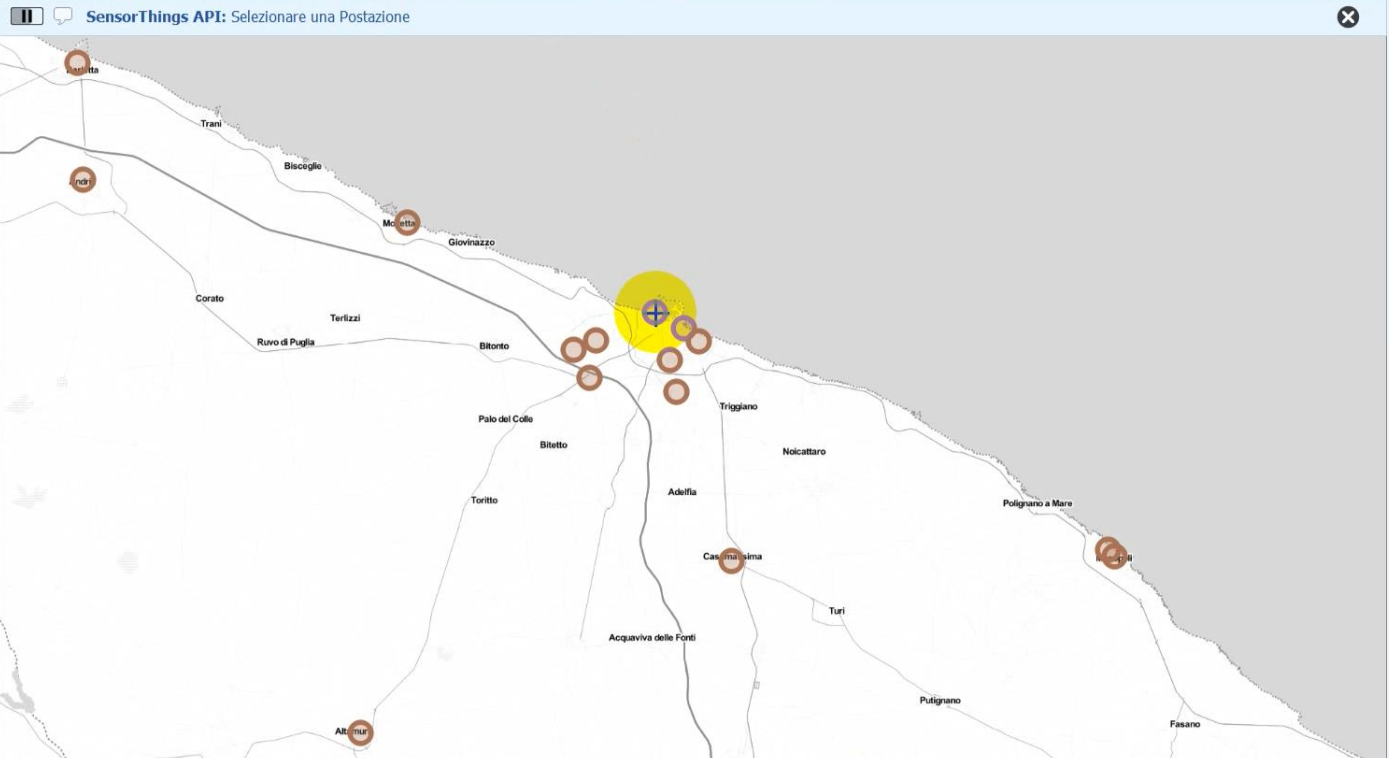
Q Digita per localizzare (Ctrl+K)

Coordinata 1874747,5062441 Scala 1:570994 Lente d'ingrandimento 100% Rotazione 0,0° Visualizza EPSG:3857



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Q Digita per localizzare (Ctrl+K)



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Postazione

STA.IT2058A

Location of station STA.IT2058A

STA.IT2058A - Measurement station STA.IT2058A

Osservazioni disponibili

Nome	Descrizione	Date rif.	Proprietà misurata	Sensore	Osservazioni
SPO.IT2058A_8_chemi_2013-01-01_00:00:00	NO2 at STA.IT2058A	02 gen 2018 - 07 giu 2023	NO2 - ug/m3	📡 SPP.IT2058A_8_chemi_2013-01-01_00:00:00	📄
SPO.IT2058A_7_UV-P_2013-01-01_00:00:00	O3 at STA.IT2058A	01 gen 2018 - 07 giu 2023	O3 - ug/m3	📡 SPP.IT2058A_7_UV-P_2013-01-01_00:00:00	📄
SPO.IT2058A_5_BETA_2013-01-01_00:00:00	PM10 at STA.IT2058A	01 gen 2018 - 31 dic 2022	PM10 - µg/m3	📡 SPP.IT2058A_5_BETA_2013-01-01_00:00:00	📄

Serie temporali complesse

Nome	Descrizione	Date rif.	Proprietà misurata	Sensore	Osservazioni
SPO.IT2058A_8_chemi_2013-01-01_00:00:00 [1 Days]	NO2 at STA.IT2058A aggregated per 1 Days	02 gen 2018 - 07 giu 2023	- NO2 (ug/m3) - NO2 Min (ug/m3) - NO2 Max (ug/m3) - NO2 Dev (ug/m3)	📡 SPP.IT2058A_8_chemi_2013-01-01_00:00:00	📄
SPO.IT2058A_7_UV-P_2013-01-01_00:00:00 [1 Days]	O3 at STA.IT2058A aggregated per 1 Days	01 gen 2018 - 07 giu 2023	- O3 (ug/m3) - O3 Min (ug/m3) - O3 Max (ug/m3) - O3 Dev (ug/m3)	📡 SPP.IT2058A_7_UV-P_2013-01-01_00:00:00	📄
SPO.IT2058A_5_BETA_2013-01-01_00:00:00 [1 Days]	PM10 at STA.IT2058A aggregated per 1 Days	01 gen 2018 - 31 dic 2022	- PM10 (µg/m3) - PM10 Min (ug/m3) - PM10 Max (µg/m3) - PM10 Dev (µg/m3)	📡 SPP.IT2058A_5_BETA_2013-01-01_00:00:00	📄





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Postazione

STA.IT2058A

Location of station STA.IT2058A

STA.IT2058A - Measurement station STA.IT2058A

Osservazioni disponibili

Nome

SPO.IT2058A_8_chemi_2013-01-01_00:00:00

SPO.IT2058A_7_UV-P_2013-01-01_00:00:00

SPO.IT2058A_5_BETA_2013-01-01_00:00:00

Serie temporali complesse

Nome

SPO.IT2058A_8_chemi_2013-01-01_00:00:00 [1 D

SPO.IT2058A_7_UV-P_2013-01-01_00:00:00 [1 Da

SPO.IT2058A_5_BETA_2013-01-01_00:00:00 [1 Da

Osservazioni

Postazione: STA.IT2058A
Location of station STA.IT2058A

Stazione: STA.IT2058A
Location of station STA.IT2058A

SPO.IT2058A_7_UV-P_2013-01-01_00:00:00
01 gen 2018 - 07 giu 2023
SPP.IT2058A_7_UV-P_2013-01-01_00:00:00 (ug/m3)

Valori Grafico

Tempo Inizio (Europa/Roma)	Tempo Fine (Europa/Roma)	Valore(ug/m3)
07/06/2023 04:00:00	07/06/2023 05:00:00	75.23
07/06/2023 03:00:00	07/06/2023 04:00:00	84.07
07/06/2023 02:00:00	07/06/2023 03:00:00	101.41
07/06/2023 01:00:00	07/06/2023 02:00:00	100.97
07/06/2023 00:00:00	07/06/2023 01:00:00	101.71

Precedente 1 Successivo

01 gen 2018 < 07-06-2023 07-06-2023 > 07 giu 2023

Sposta indietro

Nome	Osservazioni
SPO.IT2058A_8_chemi_2013-01-01_00:00:00	
SPO.IT2058A_7_UV-P_2013-01-01_00:00:00	
SPO.IT2058A_5_BETA_2013-01-01_00:00:00	





Layer

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Osservazioni

Postazione STAIT2058A Location of station STAIT2058A	Stazione STA.IT2058A Location of station STAIT2058A	SPO.IT2058A_7_UV-P_2013-01-01_00:00:00 O3 at STAIT2058A 01 gen 2018 - 07 giu 2023 SPP.IT2058A_7_UV-P_2013-01-01_00:00:00 (ug/m3)
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Valori **Grafico**

01 gen 2018 << < 01-06-2023 07-06-2023 >> >> 07 giu 2023



	Osservazioni
1-01_00:00:00	
1-01_00:00:00	
1-01_00:00:00	
Osservazioni	
heml_2013-01-01_00:00:00	
IV-P_2013-01-01_00:00:00	
ETA_2013-01-01_00:00:00	

