CLEVERNET DATA

Introduction

This document contains information necessary to understand data, formats, and results obtained from the Urban Lab Zilina. Particular chapters give you information about the data available for processing and further analysis. You will find in specific sections some additional information necessary for better understanding of data exported from CleverNet dashboards.

„Data is the new gold“ and data driven governance is a future standard of public services and the result of on-going digital transformation. The project CleverNet (funded by EU Interreg V-A Slovak Republic under the title *Implementation of innovative sensor networks in cross border regions*) aims at two key activities that should support data economy in Czech and Slovak republics.

All the information are available at the project page

Need inspiration?

- You have two kinds of data - traffic and meteo data. Each of them will give you a specific source for analysis, traffic data are more complex and bigger.
- Traffic data contains information about vehicle's categories and speed. You can compare them with some expected behavior of drivers.
- There are definitely some unexpected periodical patterns in the data. Are you able to find some of them?
- Since the traffic sensors are installed as a geo-fence, you can probably use some graph (discrete mathematics) based methods to better understanding the situation in Zilina.
- How good are the data? Does everything fit the expectation or are there some ghost data involved?

Information about the sensors, data, and formats are available in separate sections:

- Project CleverNet
- Urban Lab Data
- Sensors
- Working with Dashboards
- Understanding Data Format

Good luck and have fun with the CleverNet data!

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Urban Lab Data

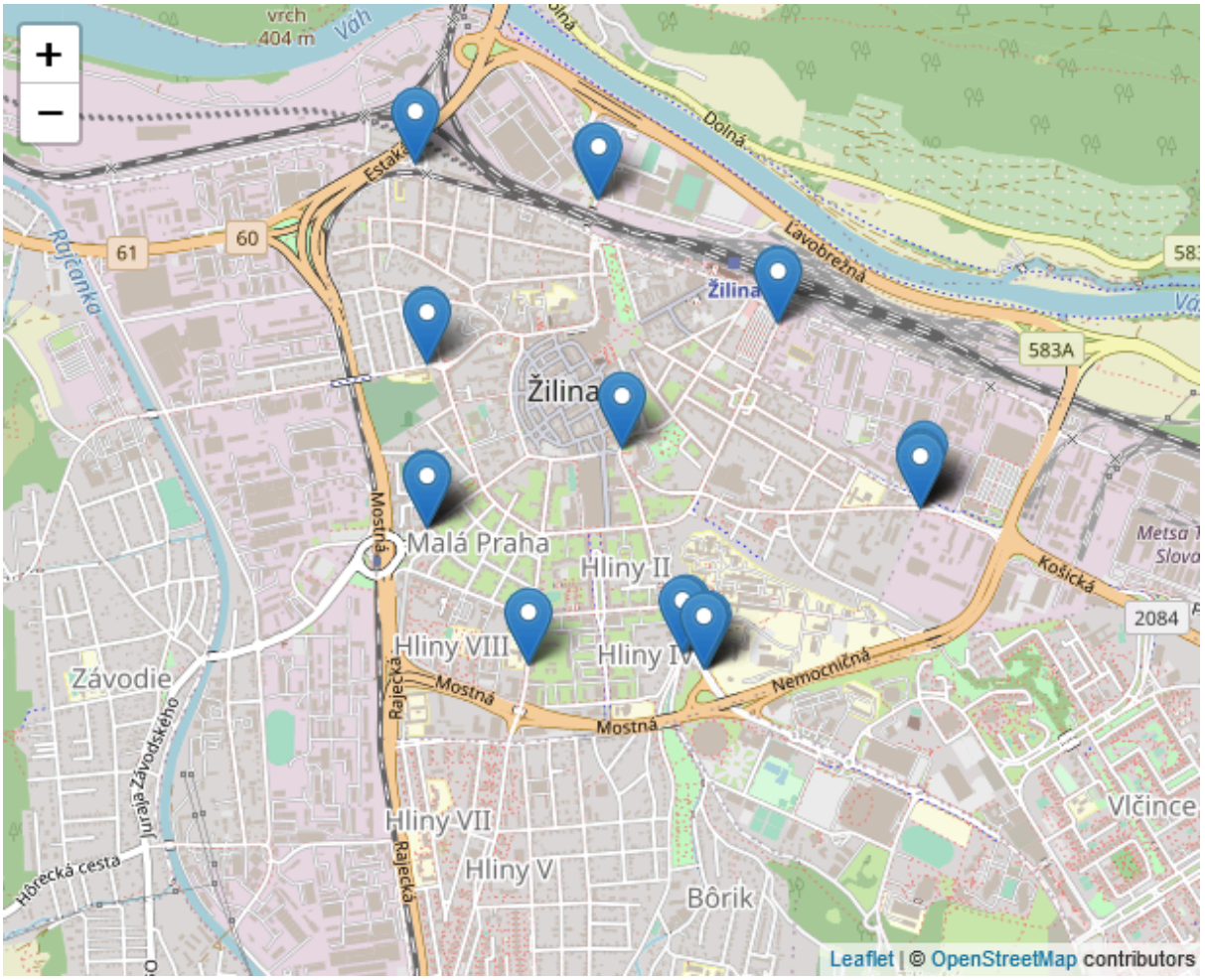
Practical showcase of sensor network implementation in the city of Žilina for data driven decision making of several city agendas: urban planning, climate change adaptation, digital economy and/or sustainable mobility.

Online traffic data. Online micro climate data.

Traffic Geofencing

Virtual fence of magnetometers counting vehicles, their length and velocity at all the gates (entrances and exits) of the city center. It manages to identify rush hours, i.e., maximum of vehicles in the city center which is valuable for parking policy or traffic safety agendas.

The location of a total of 25 traffic sensors is shown on the map.



Data are available online through live dashboard at https://dashboards.clevernet.sk

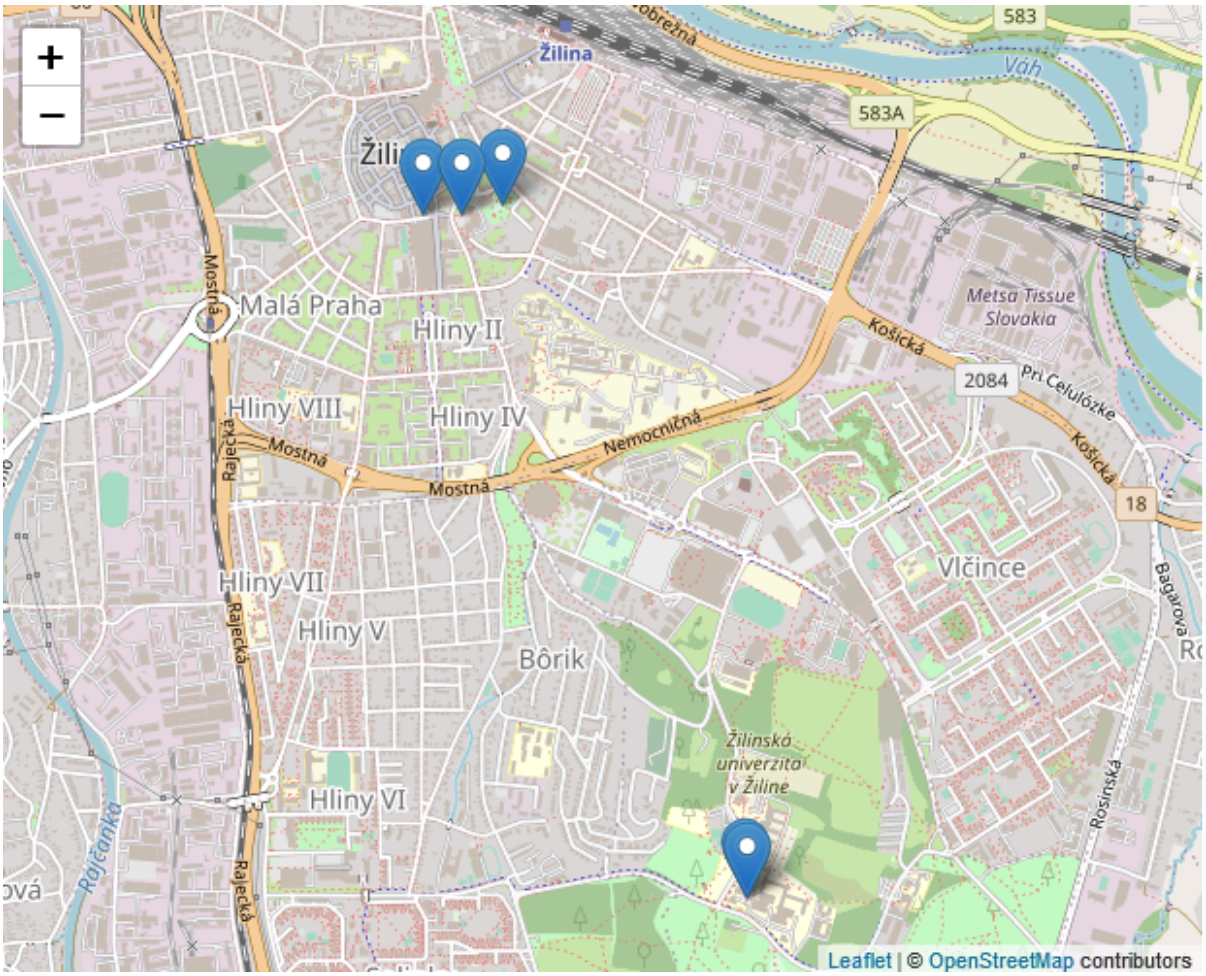
Microclimate

Based on meteo stations and special surface temperature sensors enabling a long-term monitoring of built-up areas or green spaces impacts on the quality of micro-climate and provide valuable inputs for responsible development and public space investments.

It enables us to compare built-up areas with the green ones and their impact on the temperature and humidity of various spaces as well as compare the temperature of air breathed by adults and children.

In order to compare the micro-climate, climatic conditions at three different localities are monitored:

- town center Žilina in front of the city office (location Aupark - shopping mall),
- town center Žilina city park (location Sad na Studničkách - city park),
- University campus UNIZA (location outside the urban area - campus near forest park).



Data are available online through live dashboard at https://dashboards.clevernet.sk

Dashboards allow to view data directly in defined time intervals, particular sensors could be defined, and for each partial visualization, data are available for export in different formats (.csv, JSON). Some additional formatting options are available e.g. for use with Excel.

Sensors

Each sensor installed in the Urban Lab has its own identification together with some additional information used during the transformation from raw to analytical format. The most important one is the name, ID, category/type, and GPS coordinates.

Information about sensors used in dashboards are summarized in the table below. Complete information can be downloaded as the *.csv* (comma separated) or *.xlsx* (Excel) file:

- static_data_filtered.csv
- static_data_filtered.xlsx

Overview of the sensors (names and coordinates):

	Sensor Name	Device Name	Latitude	Longitude
1	meteostation UNIZA	enviro-8111caee	49.20185343	18.75477456
2	meteostation Sad na Studnickach	enviro-8111cb30	49.22186914	18.74395989
3	meteostation Aupark	enviro-8111caaf	49.22157417	18.74046396
4	UNIZA.ground	enviro-frost-8111cb13	49.20197239	18.75464916
5	UNIZA.park.IN.temp	dd-8112573d	49.20181334	18.75474807
6	UNIZA.park.OUT	dd-8112578f	49.20179429	18.75474002
7	MU.Zilina.ground	enviro-frost-8111cb59	49.22160396	18.74215309
8	Spaniola.IN	dd-81125753	49.22166242	18.74181613
9	Spaniola.OUT.temp	dd-81125751	49.2216668	18.74177624
10	Rázusa.IN	dd-8112579a	49.22407268	18.73323105
11	Rázusa.OUT	dd-8112575e	49.22414253	18.73322066

12	Bratislavská.OUT	dd-81125784	49.22989255	18.73276066
13	Bratislavská.IN	dd-81125744	49.22985336	18.73274356
14	Kysucká.IN	dd-8112575c	49.22886263	18.74070302
15	Kysucká.OUT	dd-8112573f	49.22885453	18.7407523
16	1.mája.IN	dd-8112576d	49.22531006	18.7486789
17	1.mája.OUT	dd-8112578b	49.22529342	18.74872584
18	Tajovského/Vysokoškolakov.OUT	dd-8111caef	49.21588252	18.74468606
19	Vysokoškolakov.IN.right.lane	dd-8112574f	49.21539634	18.74555547
20	Vysokoškolakov.IN.left.lane	dd-8112578e	49.21537685	18.74551557
21	Vysokoškolakov.OUT.left.lane	dd-81125757	49.2153532	18.74544717
22	Vysokoškolakov.OUT.right.lane	dd-81125747	49.21534247	18.74541331
23	Tajovského.IN	dd-8112574b	49.2157888	18.7445607
24	Tajovského.OUT	dd-81125791	49.21579296	18.74451041
25	Štefánika.IN	dd-8112577b	49.22028064	18.7550867
26	Košická.IN.right.lane	dd-8112576b	49.22005574	18.75496499
27	Košická.IN.left.lane	dd-81125796	49.22002749	18.75496566
28	Košická.OUT.left.lane	dd-8112578d	49.21999683	18.75496432
29	Košická.OUT.right.lane	dd-81125772	49.21997428	18.75496365
30	Komenského.OUT	dd-8111cb3b	49.21545701	18.73768285
31	Komenského.IN	dd-811115a5	49.21545263	18.73772945

32	Hálkova.OUT.right.lane	dd-8111cac0	49.21944629	18.73320591
33	Hálkova.OUT.left.lane	dd-8111cae4	49.21943315	18.73322133
34	Hálkova.IN.left.lane	dd-8111cae0	49.2194187	18.73324178
35	Hálkova.IN.right.lane	dd-8111cad5	49.21940447	18.73325922

Working with Dashboards

Most of the functionality on dashboards is the same for both, traffic and meteo data. Specific functionalities will be described later at the end of this document. Dashboards are implemented in Grafana, a complete observability stack that allows users to monitor and analyze metrics, logs and traces. It allows you to query, visualize, alert on and understand data.

Main View

The **main view** - dashboard, consists of specific widgets with different visual representation of data. There are already prepared widgets with the main features to quickly observe and understand the situation measured by sensors.

Widgets

Widget or *panel* is the basic visualization building block in *Grafana*. Each panel has a query editor specific to the data source selected in the panel. The query editor allows you to extract the perfect visualization to display on the panel.

Data Export

Data export is available with the *panel inspector* indicated by the name of the widget which is situated at the top of each widget. To download data in specific format (.csv, JSON) you can open the result generated by the query and download data by selecting the Inspect option from the menu.



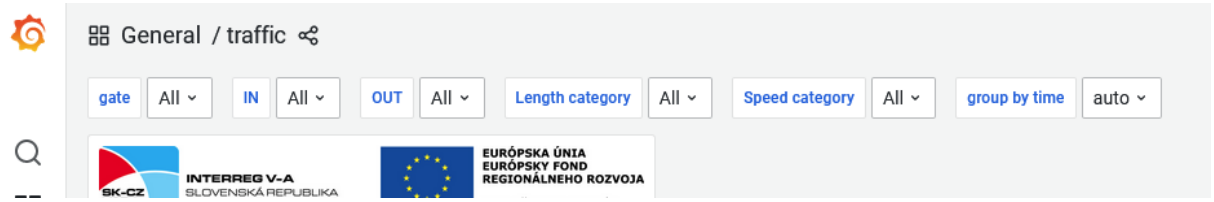
Time Interval

The time interval is critical of data and analysis of some time-dependent patterns or periodical events. You can work with smaller time series to have quicker results or with large datasets with broader timescale. Be careful what method of data processing you will choose, cause it can affect the need for computational resources significantly.

The time range can be defined by dialog initiated by the “clock” button in the top right part of the page:

Filtering Data

At the top of the page, the bar with different options is displayed. By using the bar, you can configure your view for different data - you can specify the filter for data used in the dashboard.



By the filtering options, you can check the situation in detail and have a better overview of data you want to use. Good filter can help you to find out what information (result) you can obtain by different kinds of data. Remember, if there is no desired information in the data, it will not appear in the result!

For more information, you can check the Grafana documentation.