

User Interface

This section guides you through how to interact with Qosium Storage.

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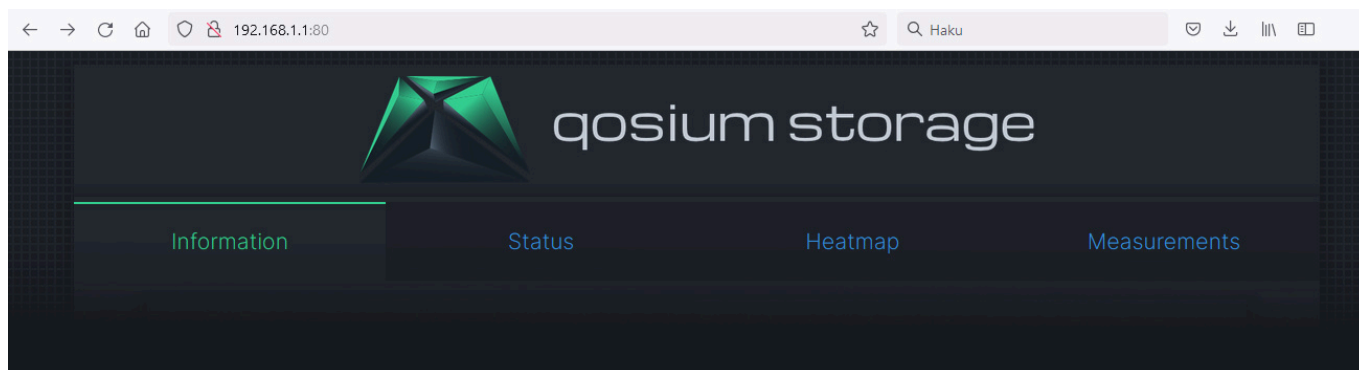
1. Accessing

Qosium Storage is used via a web browser. Thus, open your browser and type the address and port where your Storage's web server is bound. If you don't know Qosium Storage's port, check the [parameters](#).

2. Tabs

2.1. Overview

When you enter Qosium Storage, you will land on the main page in the Information tab. There are typically three other tabs also visible.



Sometimes the Heatmap tab might be missing. If so, it has just been disabled. Via parameters, you can activate it. The next sections discuss the content of each tab.

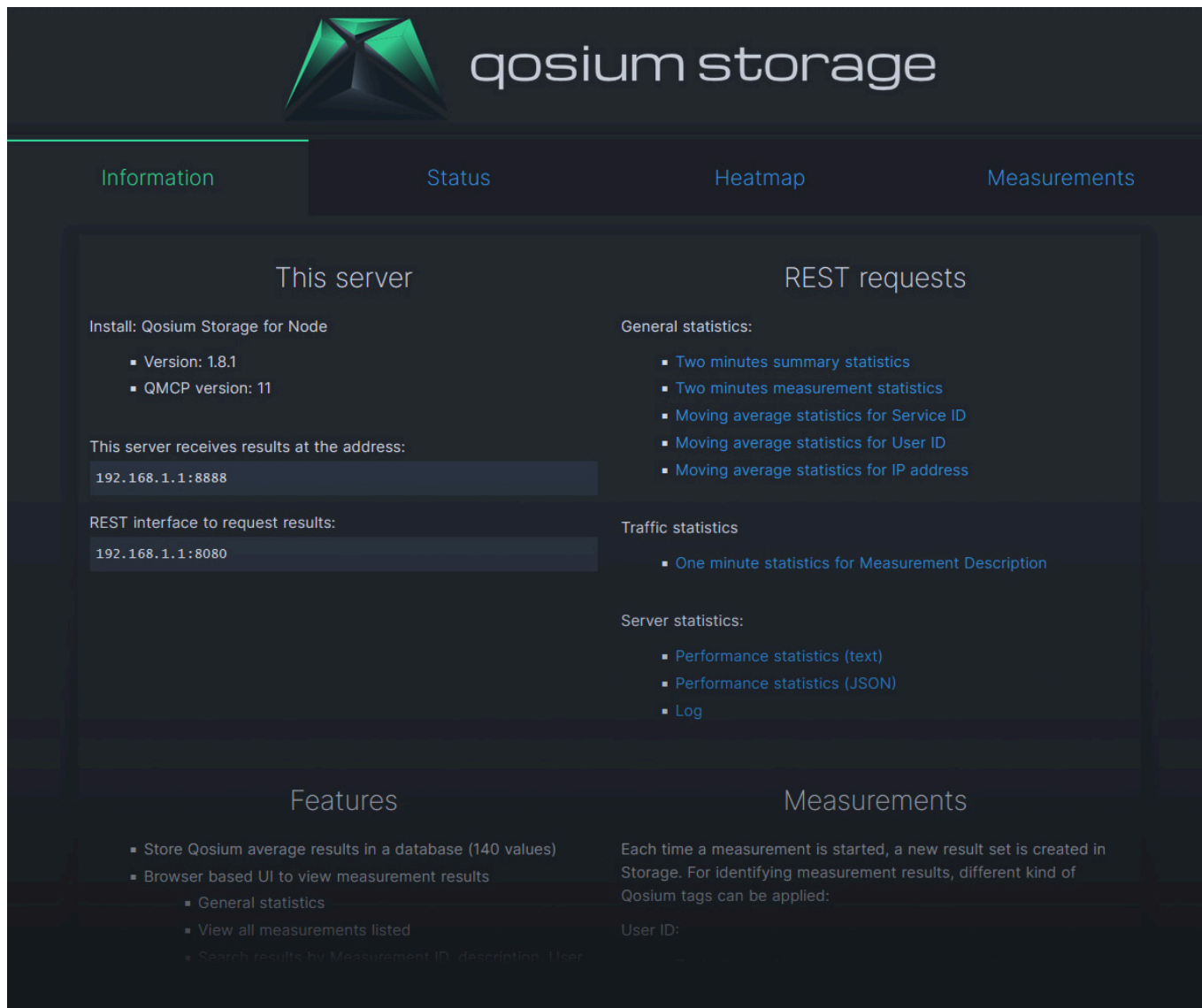
2.2. Information

Information tab is all about what the name says: information regarding the current installation of Qosium Storage. The information is split into four sections.

This server section tells the installation name, version, and relevant server ports. It also tells the QMCP main version, which is of importance since different main versions are typically non-interoperable. For instance, if you are running an outdated Qosium version of QMCP 10, you cannot send results to Qosium Storage with QMCP 11.

REST requests section shows some general REST requests available, and they can also be tested through the links. These are, however, not all the available REST calls, and more REST calls can be easily provided. In case you are interested, contact Kaitotek support to inquire about the *REST API documentation of Qosium Storage*.

Features section lists some of the main features of your version of Qosium Storage. And last, the *Measurements* section tells basic principles of how measurements and results in Storage correlate and how Qosium Storage uses the different identifications of Qosium.



2.3. Status

Status tab is the place to get up-to-date information on Qosium Storage itself. It is divided into three sections.

The first section shows ongoing measurements within the last two minutes period per Qosium's **Service ID**. As seen in the figure below, there are four ongoing measurements.

The second section shows the results reception performance. The observation interval is parameterized using [this parameter](#). The columns are as follows:

- *Time* – When the performance calculation was made.
- *Senders* – The number of results senders (= measurements) that were ongoing
- *Received* – The total number of average results received
- *Queued* – The number of average results waiting to be stored
 - Regarding Qosium Storage's health, this is an important performance metric, as it indicates can Storage keep up with the pace the results are being received.
 - If the queue starts to pile up, it might be an indication that there are not enough computational resources for Qosium Storage to serve the current monitoring scenario.

- *Total time* – The total time spent for receiving the measurement results
 - Unit: ms
- *Average (ms)* – The time it took, on average, to receive a single result
 - This is yet another important performance metric.
 - A well-performing system should handle the reception procedures in one millisecond, and definitely < 10 ms.
 - Unit/resolution: ms
- *Last time (ms)* – The time it took to receive the last result
 - Comparing this with the previous performance metric gives an idea of how much there is deviation in the reception procedure durations between samples.
 - If the deviation is high, it is a potential indication of problems.
 - Unit/resolution: ms

The third section is about results storing performance. Most of the columns are analogous to those in the second section but now considering storing instead of receiving. Thus, these performance metrics tell how the database storing processes are functioning.

The only column having no corresponding one in the second section is *Threads*. It tells how many computational threads are currently active connecting and writing to the database. In heavy-load situations, there can be several tens of threads. This is mostly informative and typically not an indication of performance problems. Instead, the storing times (*Average (ms)* and *Last time (ms)*) are mostly the ones to follow.

Quality statistics for the past two minutes:

- Service ID: 1000 0.0% 2 pcs.
- Service ID: 10 0.0% 1 pcs.
- Service ID: 20 0.0% 1 pcs.

Server performance for results receiving

Time	Senders	Received	Queued	Total time	Average (ms)	Last time (ms)
14.06.2022 13:17	4	1873	0	3258	2	1
14.06.2022 13:16	2	1853	0	3213	1	1
14.06.2022 13:16	2	1833	0	3185	1	1
14.06.2022 13:16	2	1813	0	3157	1	1
14.06.2022 13:16	2	1793	0	3129	1	1
14.06.2022 13:16	2	1773	0	3100	1	1
14.06.2022 13:16	2	1753	0	3072	1	1
14.06.2022 13:15	2	1733	0	3044	1	1

Server performance for results storing

Time	Stored	Total time	Average (ms)	Last time (ms)	Threads
14.06.2022 13:17	1876	14808	0	7	0
14.06.2022 13:17	1876	14808	0	7	1
14.06.2022 13:17	1876	14808	8	7	2
14.06.2022 13:17	1868	14745	6	7	2

2.4. Heatmap

Heatmap is handled in its own [article](#) because it is a larger entity.

2.5. Measurements

Measurements tab shows a list of all the stored measurements as a table, including some key elements of measurement identification.

The first column is the Storage's running number of the measurement. By clicking that, you can access the measurement data shown as a large table, potentially of several pages, depending on the length of the measurement. While this might be useful for quick evaluation, detailed analysis often requires downloading the measurement data, and the last column of the Measurements tab can do that.

Measurements tab also shows a quick glance at the overall quality in the *Stats* column. Starting and ending times of the measurement are shown in columns *Started* and *Ended*, respectively. If the *Ended* column shows *On-going*, the measurement has not yet finished. Sometimes it can happen that the network

connection between Qosium Storage and the Qosium Probes carrying out the measurement has gone down. As a result, no measurement end notification arrives at Qosium Storage. In this case, Qosium Storage shows the measurement as ongoing for some time until, because no new results come, a judgment is made that the measurement must have ended.

Each measurement has a unique Qosium Storage identifier string in the second column. **Service ID, User ID, and Probe (Primary one)** are related to measurement identification, shown in the respective columns. Those can also be clicked for instant search. For example, by clicking *Service ID 1001*, performs a search listing all measurements carried out with *Service ID 1001*. You can execute custom text searches in the upper left corner. In addition to the different IDs, the [Description](#) field is also included in the search.

The screenshot shows the Qosium Storage web interface. At the top, there's a navigation bar with tabs for Information, Status, Heatmap, and Measurements. Below the navigation, there's a search bar with a 'Search' button and a 'Refresh' button. The main content area displays a table of search results. The table has columns for #, Measurement, Stats, Started, Ended, Service ID, User ID, Probe, Description, and Export results. The first row is highlighted, and several cells are annotated with red boxes and arrows pointing to them. The annotations are: 'Access the measurement data' pointing to the Measurement column, 'Get all with this Service ID, User ID, or Probe' pointing to the Service ID, User ID, and Probe columns, and 'Download the raw results' pointing to the Export results column.

#	Measurement	Stats	Started	Ended	Service ID	User ID	Probe	Description	Export results
15	1001-500-1653321983		23.05.2022 19:06	On-going	1001	14	192.168.0.110	Field test, Vehicle 4	Download
14	1004-500-1653321909	1.0 98.0%	23.05.2022 19:05	23.05.2022 19:06	1004	1	192.168.0.126	Field test, Pedestrian 1	Download
13	1003-500-1653321358	4.3 98.0%	23.05.2022 18:55	23.05.2022 19:04	1003	2	192.168.0.150	Field test, Pedestrian 2	Download
12	1005-500-1653320958	5.0 100%	23.05.2022 18:49	23.05.2022 19:50	1005	5	192.168.0.198	Field test, Vehicle 5	Download
11	1005-500-1653319953	3.0 100%	23.05.2022 18:32	23.05.2022 18:48	1005	4	192.168.0.198	Field test, Vehicle 4	Download
10	1004-500-1653319904	5.0 100%	23.05.2022 18:31	23.05.2022 18:42	1004	3	192.168.0.126	Field test, Vehicle 3	Download
9	1004-500-1653319721	4.0 98.0%	23.05.2022 16:15	23.05.2022 19:16	1004	12	192.168.0.126	Field test, Vehicle 2	Download
8	1003-500-1653311134	1.0 98.0%	23.05.2022 16:05	23.05.2022 16:14	1003	15	192.168.0.150	Field test, Vehicle 5	Download
7	1002-500-1653310247	4.2 98.0%	23.05.2022 15:50	23.05.2022 16:04	1002	14	192.168.0.111	Field test, Vehicle 4	Download
6	1001-500-1653309518	1.8 88.9%	23.05.2022 15:38	23.05.2022 15:42	1001	15	192.168.0.110	Field test, Vehicle 5	Download

3. Heatmap

Heatmap is the most visual element of Qosium Storage, raising performance monitoring of wireless networks to a new level. While the heatmap is at its best when dealing with wireless networks, it can also serve fixed network monitoring since Qosium Probes can be given a fixed location.

3.1. General

To use Storage's heatmap functionality, you need Internet access because the map is downloaded online dynamically.

The metric visualized is Qosium's QoE, i.e., GQoS or PSQA. Main coloring is logical:

- No color: no results
- Green: Good performance
- Yellow: Average performance
- Red: Bad performance

In practice, there are countless shades between the main colors to indicate how bad or good the

performance is.

3.2. Control

Controlling the map is easy and similar to the heatmap of Qosium Scope:

- Zoom in/out:
 - Keyboard: +/-
 - Mouse: wheel
- Move:
 - Keyboard: the arrow keys
 - Mouse: left button + moving
- Rotate / tilt
 - Keyboard: shift + the arrow keys
 - Mouse: right button + moving
- Selection zoom
 - Mouse+keyboard: shift + left button + moving

3.3. Sections

The *Heatmap* tab is divided into three sections:

The screenshot displays the Qosium Heatmap interface with four tabs: Information, Status, Heatmap, and Measurements. The Heatmap tab is active, showing a map with a color-coded heatmap overlay. A dropdown menu is open in the top left, showing options for 'Received traffic (latest) 23.05.2022 15:24 - 23.05.2022 20:19', 'Lowest MOS values', 'Longest delay (ms)', 'Longest jitter (ms)', and 'Longest conn. break (s)'. Below the map is a table of performance metrics for various Service IDs. At the bottom, there are input fields for selecting Service IDs, with a note that 8 Service IDs are available.

The map section shows a heatmap overlay on a street map, with colors ranging from green (low delay) to red (high delay). The map includes street names like SAARISTONKATU, RANTAKATU, KAUPPUKATU, and LEISANTIEKATU.

The performance summary table is as follows:

Service ID	Received traffic					Sent traffic					Throughput		Data transfer
	QoE	Delay ms	Jitter ms	Loss ratio %	Conn. break s	QoE	Delay ms	Jitter ms	Loss ratio %	Conn. break s	Max kbs	Total KB	
1004	3.93	163.86	13.60	0.00	0.095	3.84	167.92	7.136	NaN	0.311	1117	1225730	
1005	4.99	121.93	0.073	0.07	2.145	4.99	2.272	0.046	NaN	3.214	1072	235172	
1003	4.44	137.42	7.275	0.03	0.461	4.24	147.62	3.887	NaN	0.154	1061	130617	
1002	4.99	18.10	0.082	0.26	8.098	4.99	2.607	0.047	NaN	9.037	1107	201522	
1001	4.99	1.014	0.055	0.05	0.316	4.99	0.324	0.051	NaN	3.279	1061	187423	

Optional Service ID selection: 1001-1002, 1003-1004

The map section

Service ID performance summary & visibility selection

Optional Service ID selection

Qosium Storage's heatmap is currently tightly bound to Qosium Probes' **Service ID**. That is because **Service ID** is often used to distinguish devices in the field, making it a device ID. Thus, **Service ID** is the natural identifier according to which you can select results in the map. In addition to selection possibilities, the middle section in the Heatmap tab shows QoS summaries per **Service ID**.

3.4. Select What to Show

3.4.1. General

There are many ways to select what to show on the map. The two main dimensions according to which you can select results are currently:

- Time and
- **Service ID**.

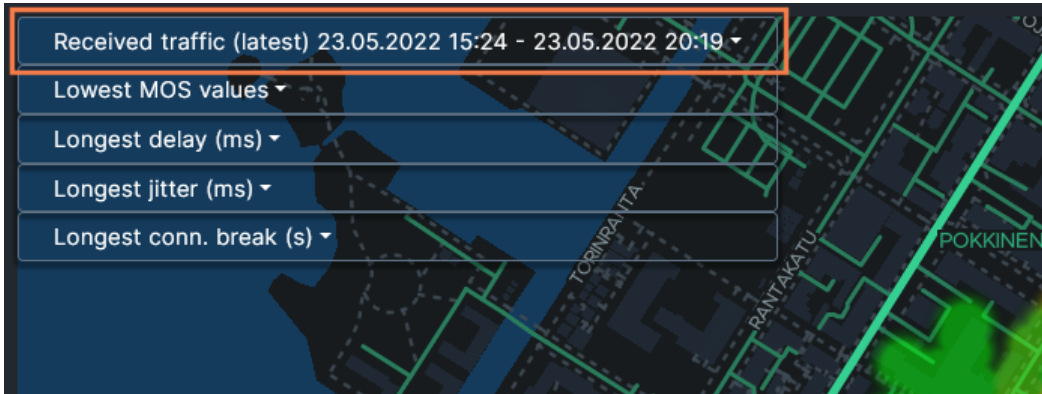
In addition, you can select that does the visualized quality consider sent or received traffic.

The typical workflow is to select the interesting time window and then filter the **Service ID**'s you wish to observe.

3.4.2. Time Selection

The time window from which to show results on the map can be a real-time window or your selection in the

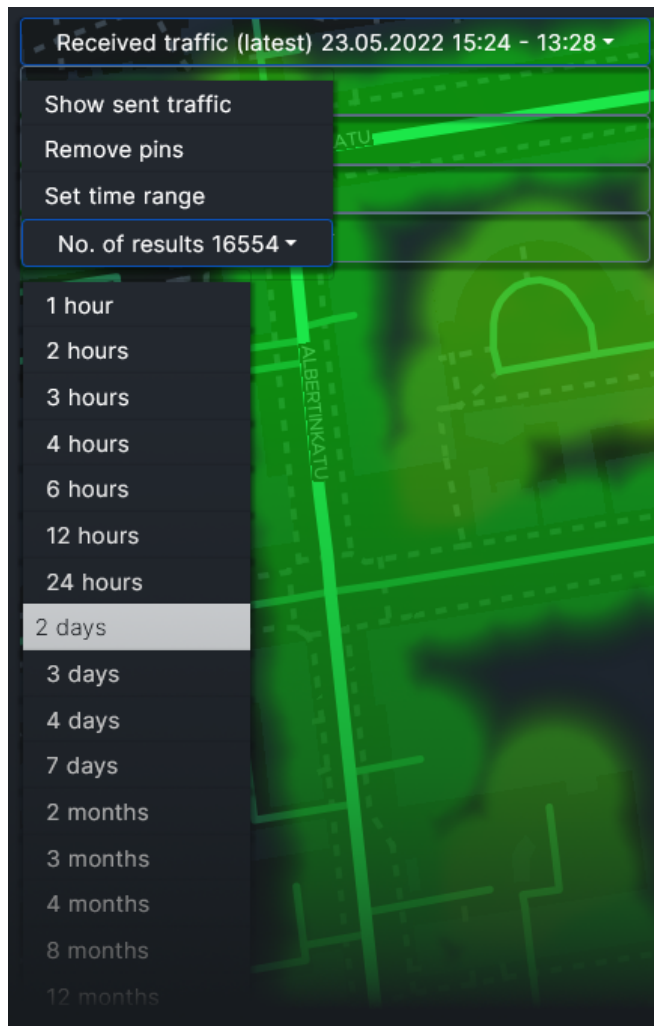
past. The currently visible time window is shown in the top row of the control panel, located in the upper left corner of the map:



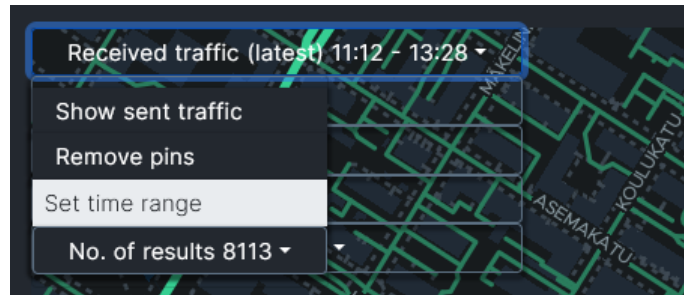
When the text "latest" is visible, it means that the view is in real-time mode:



To set the time window in the real-time mode, click the top row of the control panel first. A smaller menu opens up. There, click the lowest item, Number of results. Now you see that a list opens where you can pick the size of the real-time window., e.g., two days:




To show a specific time range in the history, click the top row: the menu pops up again. Then select *Set time range*:




A separate box opens, letting you set the time range. Set the desired lower bound (From) date and time and then the desired upper bound (To) date and time. When done, press *Query results*.

A screenshot of a 'Set time range' dialog box. It has a title 'Set time range' and a subtitle 'Draw heatmap using results from a time range.' Below this, there are two sections: 'From date and time' and 'To date and time'. Each section has a table with 'Date' and 'Time' columns, and an 'Epoch' field below. The 'From' section shows Date: 23.05.2022, Time: 15:30, and Epoch: 1653309001.184. The 'To' section shows Date: 23.05.2022, Time: 16:30, and Epoch: 1653310200.637. At the bottom right, there are two buttons: 'Query results' and 'Back'.

After fetching the results, a new heatmap is drawn with the newly selected time range.

 After setting the time range like this, the map no longer updates in real-time.

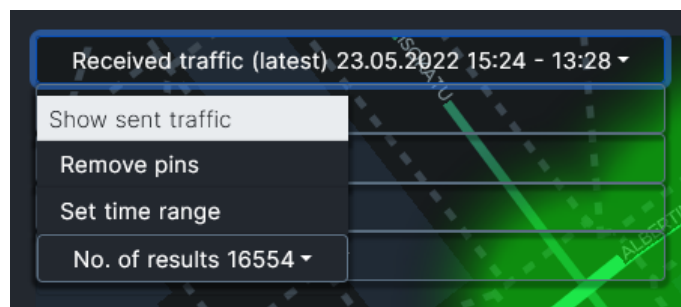
 If the selected time range contains results only in a certain shorter interval, then that interval will be shown instead of the set time range.

If you want to get back to the real-time view, click the menu open again and select the new option: *Back to latest values*.



3.4.3. Direction

The control panel's top row tells the current direction of the visualized traffic. To change it, click the top row: the already familiar menu pops up. Then select the other direction, e.g., sent traffic:



3.4.4. Service ID selection

By default, the heatmap shows all the results in the selected time interval. Results can, however, be filtered in and out according to **Service ID**. That is done in the *Measurements on map* table below the heatmap. The rows show key statistics averaged over the **Service IDs** shown in the first column. Click the desired **Service ID** to get a pop-up list of three items:

- *Show on map*: Adds a pin pointing the last location of the set on the heatmap.
- *Hide from map*:
 - Hides the results set from the heatmap.
 - The results set of this **Service ID** is transferred below in the list of hidden **Service IDs**.
 - By clicking the **Service ID** in the list below, you get the results back on the map.
- *Show this only*:
 - Hides all the other results and shows only results with this **Service ID**.
 - To restore all the results, click the **Service ID** and select *Show all*.

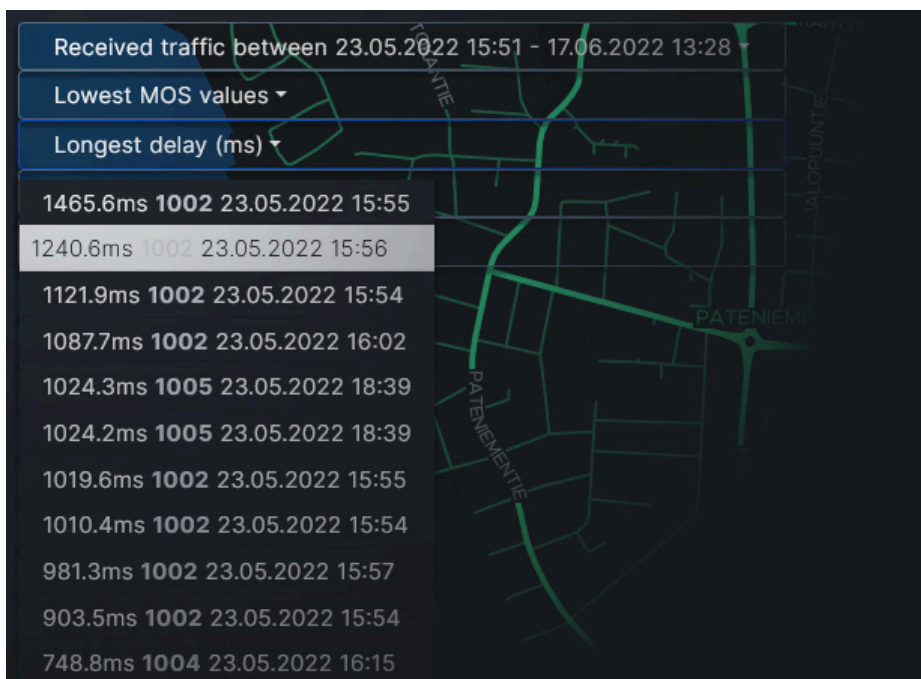
Measurements on map	Received traffic				
Service ID	QoE	Delay ms	Jitter ms	Loss ratio %	Conn. break s
1004 ▾	3.93	163.86	13.60	0.00	0.095
Show on map	4.99	121.93	0.073	0.07	2.145
Hide from map					
Show this only	4.44	137.42	7.275	0.03	0.461
1002 ▾	4.99	18.10	0.082	0.26	8.098
1001 ▾	4.99	1.014	0.055	0.05	0.316

No. of Service IDs hidden from map is 1 , click an ID to restore.

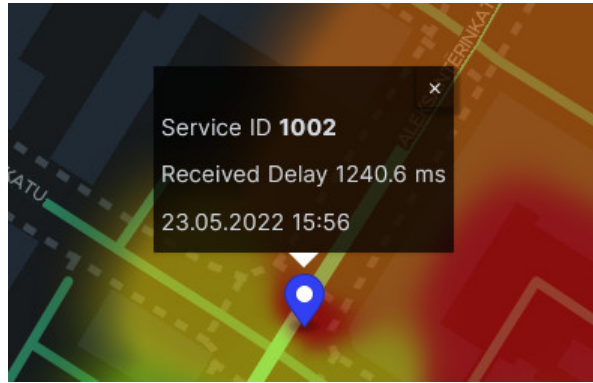
1006

3.5. Pinpointing Values

There is a nice feature in the heatmap that allows you to pinpoint interesting events. Just below the time range in the control panel, you can open drop-down selections of extreme values of different statistics. For example, in the *Longest delay (ms)* selection, you can see the longest individual delay values among the results currently shown. By selecting one of the values, you get a pin on the map revealing the location of this occurrence.



There can be multiple pins on the map at the same time. By clicking a pin, you get information about that particular measurement result.



To remove the pins on the map, open the drop-down menu of the control panel and select *Remove pins*.

