BERNARD GRUPPE

Operating Instructions

Data Center

Survey Configuration & Data Analysis

11/2026

The **Data Center** provides **survey configuration**, result viewing, and **analysis of traffic and parking data**.

Table of Contents

Data Center 5

Choose your survey type 6

Counting 7

Traffic counting 8

Turning movement counting 9

Configuration of the survey 10

Configuration of the intersections for data preparation 11

Selection of the tenant 11

Definition of key data (location, date and class selection) 14

Adding / editing of cameras 16

Editing of the routes 18

Configuration of the routes 19

Configuration of turning movements / Definition of origin destination flows 21

Checking the configuration 25

Deletion and adding of origin destination flows 25

Data analysis 27

Overview of the survey 29

Daily traffic distribution 30

Evaluation 31

Weather data 32

Turning movement counts 33

Download the analysis file 34

Evaluation file 36

Speed Data 38

Temporal Progression 38

Cumulative Distribution 38

Parking – Overview 40

Survey Configuration 41

Configuration of parking surveys 42

Selecting the Tenant 42

Defining Survey Parameters (Location, Date, and Class Selection) 45
Adding and Editing Cameras 47
Parking Area Configuration 50
Creating Groups 50
Configuring Survey Patterns for a Group 51
Entry/exit balancing 51
Additional Notes 52
Single-space detection 52
Additional Notes 53
Configuration Validation 53

Data Analysis 55

1. Purpose of the Dashboard 56
2. Header Section – Survey & Location 57
2.1 Survey Information 57
2.2 Configured BMA Units 57
2.3 Analyzed Vehicle Classes 57
2.4 Map View 58
3. Toolbar & Time Period Control 59
3.1 Select Time Period 61
3.2 Temporal Resolution 61
3.3 Displayed Groups 61
4. Current Occupancy of the Parking Area 62
4.1 Auto-Refresh 62
4.2 Occupancy Tiles 62
5. Historical Analysis – Occupancy 63
5.1 Diagram Type 63
5.2 Contents 63
6. Historical Analysis – Entries and Exits 64
6.1 Diagram Type 64
6.2 Interpretation 64
7. Interaction Options Below the Diagrams 65
7.1 “Reset Zoom” 65
7.2 “Show Capacities” 65
7.3 “Mark Incomplete/Missing Data” 65

8. Known Limitations 66

Traffic Flow 67

Configuration of a Traffic Flow survey 68

Configuration of a Traffic Flow survey 69

Selection of the Tenant 69

Add Survey 70

Definition of key data (date and traffic types) 71

Add/edit cameras 73

Configuration of a cordon 76

Node 76

Trigger 78

Publish survey 79

Data analysis 80

Overview of the survey 81

Traffic data 82

Dynamic Journey Time Filter 84

Data export 87

Data Center API 89

Data Center

Use Data Center to configure surveys, view their results, and analyse traffic and parking data.

Choose your survey type

- **Counting:** Configure and analyse traffic-counting and turning-movement surveys.
- **Parking:** Configure and analyse parking surveys.
- **Traffic flow:** Configure and analyse traffic-flow surveys.
- **Integrate with Data Center:** Retrieve survey data and statistics through the API.

Counting

The traffic survey distinguishes between traffic counting and turning movement counting. Both types of survey can be configured and visualized with the Data Center.

Traffic counting

As part of the cross-section count, various traffic classes such as cars and trucks are recorded that pass a defined road section, the so-called count cross-section, during a specified period of time.

Turning movement counting

A turning movement survey is a local method of traffic flow analysis that is primarily used at intersections. In this case, the cross-section count is further broken down by travel direction.

Configuration of the survey

Configuration of the intersections for data preparation

Once the BMA is successfully mounted and configured as described in the "BERNARD Mobility Analyser" operating instructions, open the web browser and enter the following address:

https://datacenter.bernard-gruppe.com/

You can log in to the website with your client login. If you have problems logging in or have forgotten your password, client service can help you. Once you have successfully logged in, the user interface shown in Figure 1 will appear.

To create a survey, first open the highlighted "Configuration" tab at the top right of the menu bar.

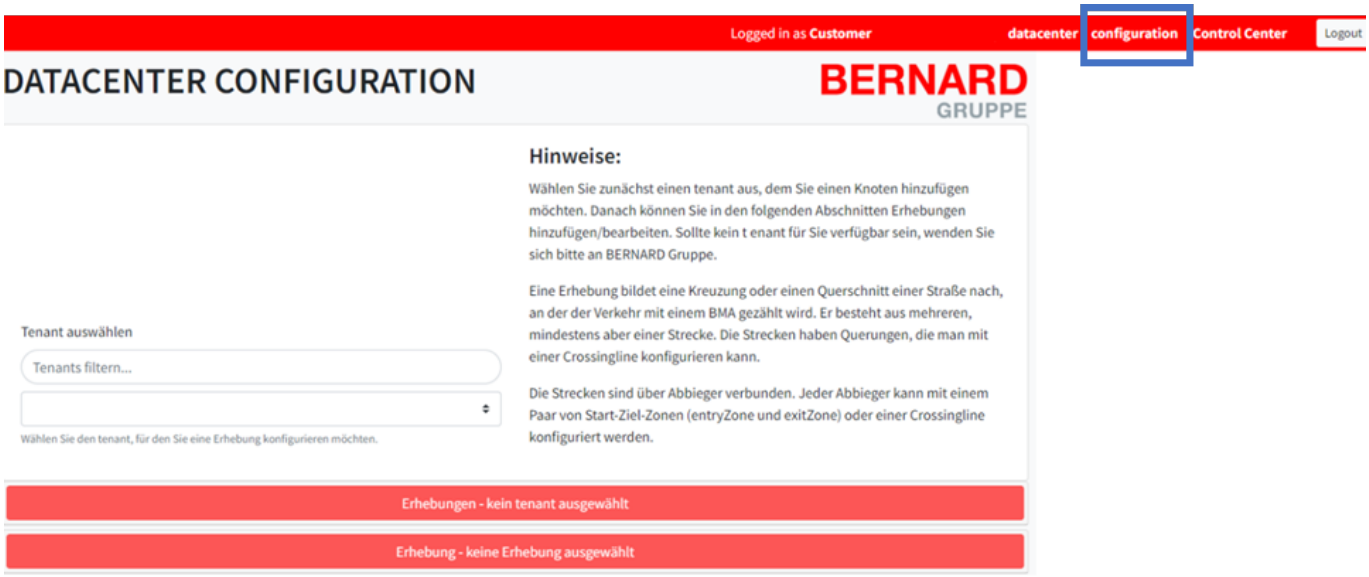


Figure 1: Data Center user interface

Selection of the tenant

Next, select the desired tenant to continue with the configuration. The tenant can be used to group measurement series. If you require more than one tenant, please contact customer service. After selecting the tenant, a list opens with the surveys already created.

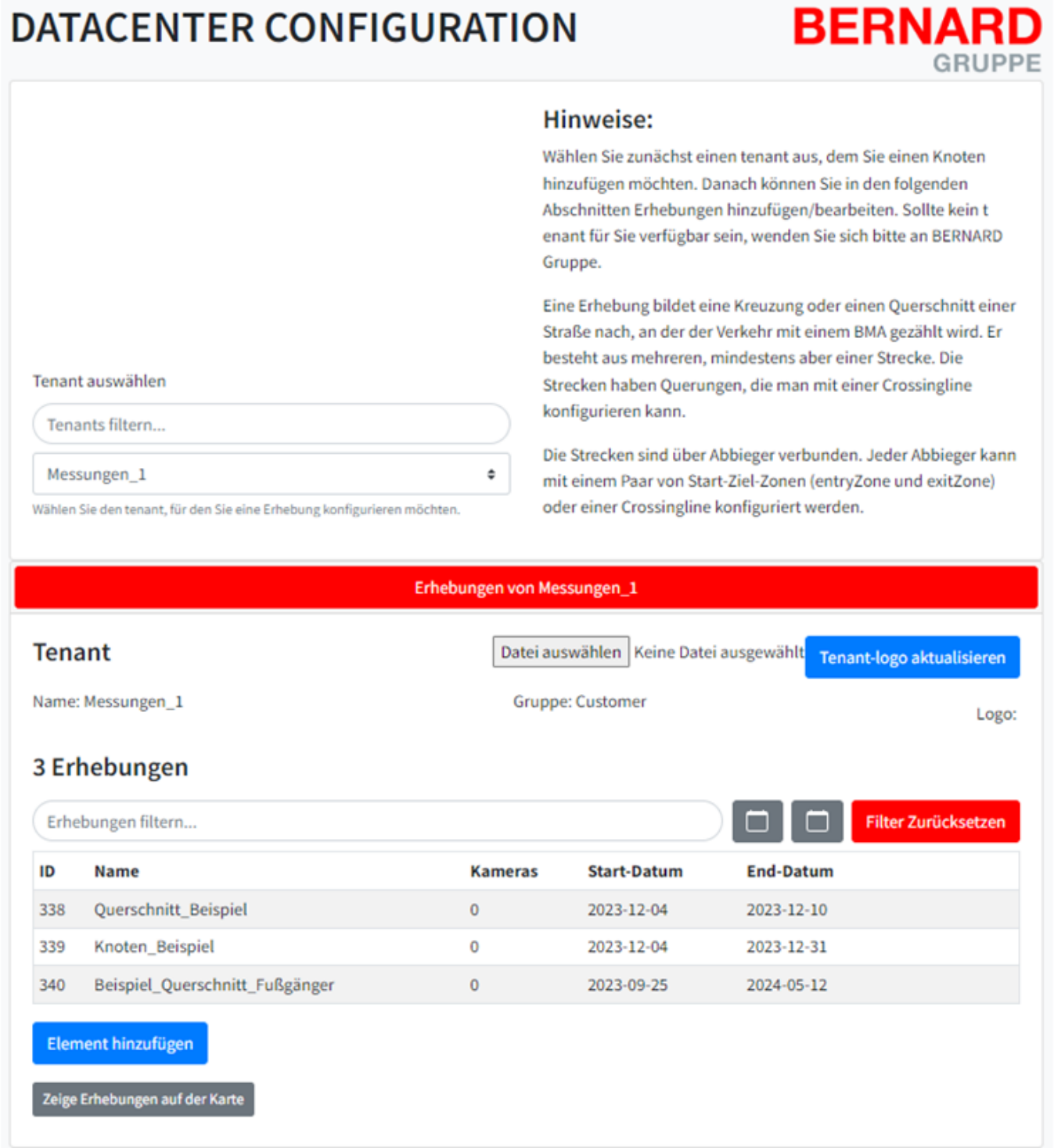


Figure 2: Data Center list of surveys in the corresponding tenant

You have the option of filtering your surveys by date or text content. It is therefore advisable to select the name of the survey so that it can be easily found later and, if necessary, different groupings are possible using the text filter (e.g. location/project number).

A new survey can be created using the "Add element" function. A new field is created in which the name of the survey must be defined. Save the process with the blue button with the memory card symbol.

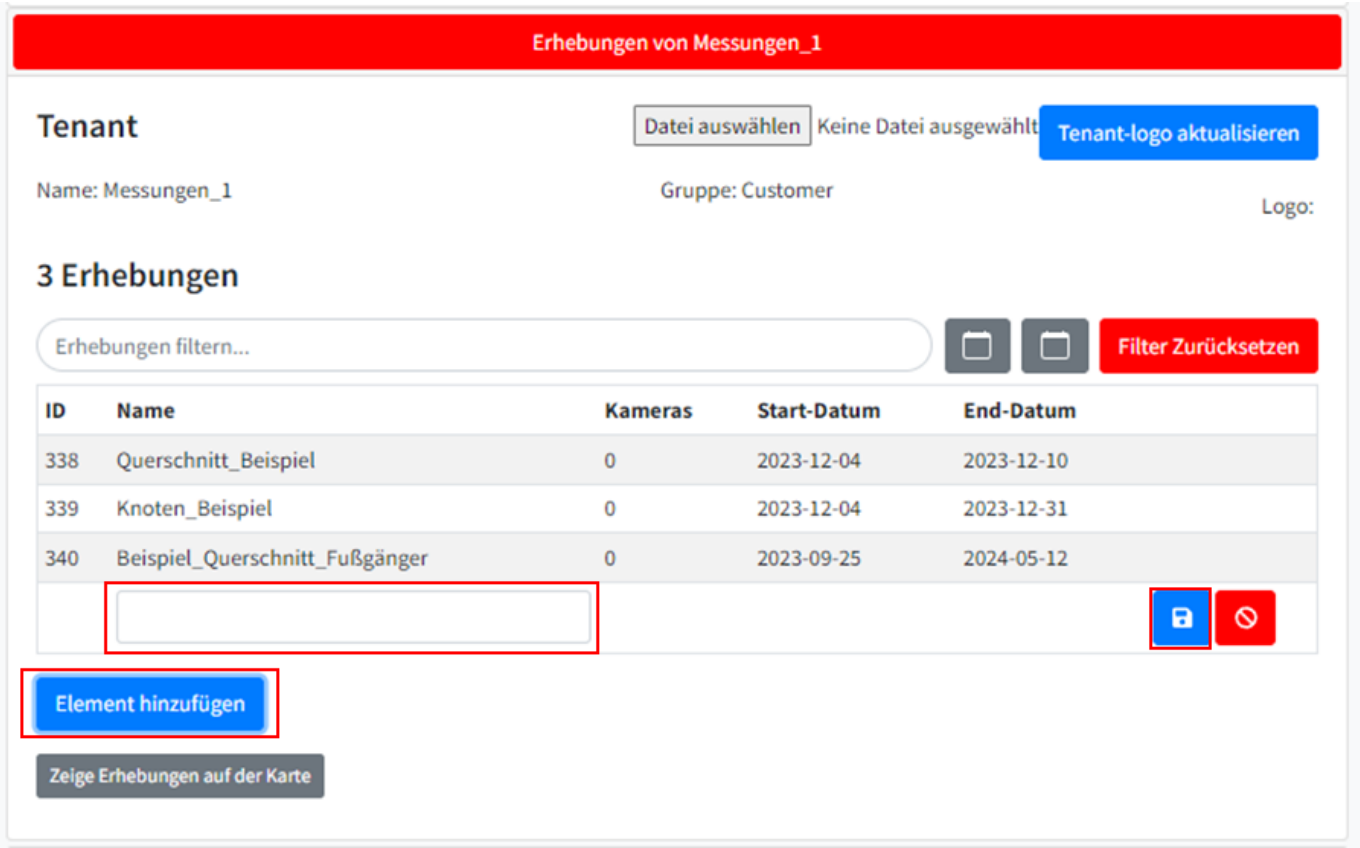


Figure 3: Adding a new survey.

To edit a created survey, select the corresponding survey by clicking on it. A user interface then opens below the list of created surveys (see Figure 4). The selected survey can be configured using the highlighted "Edit" button.

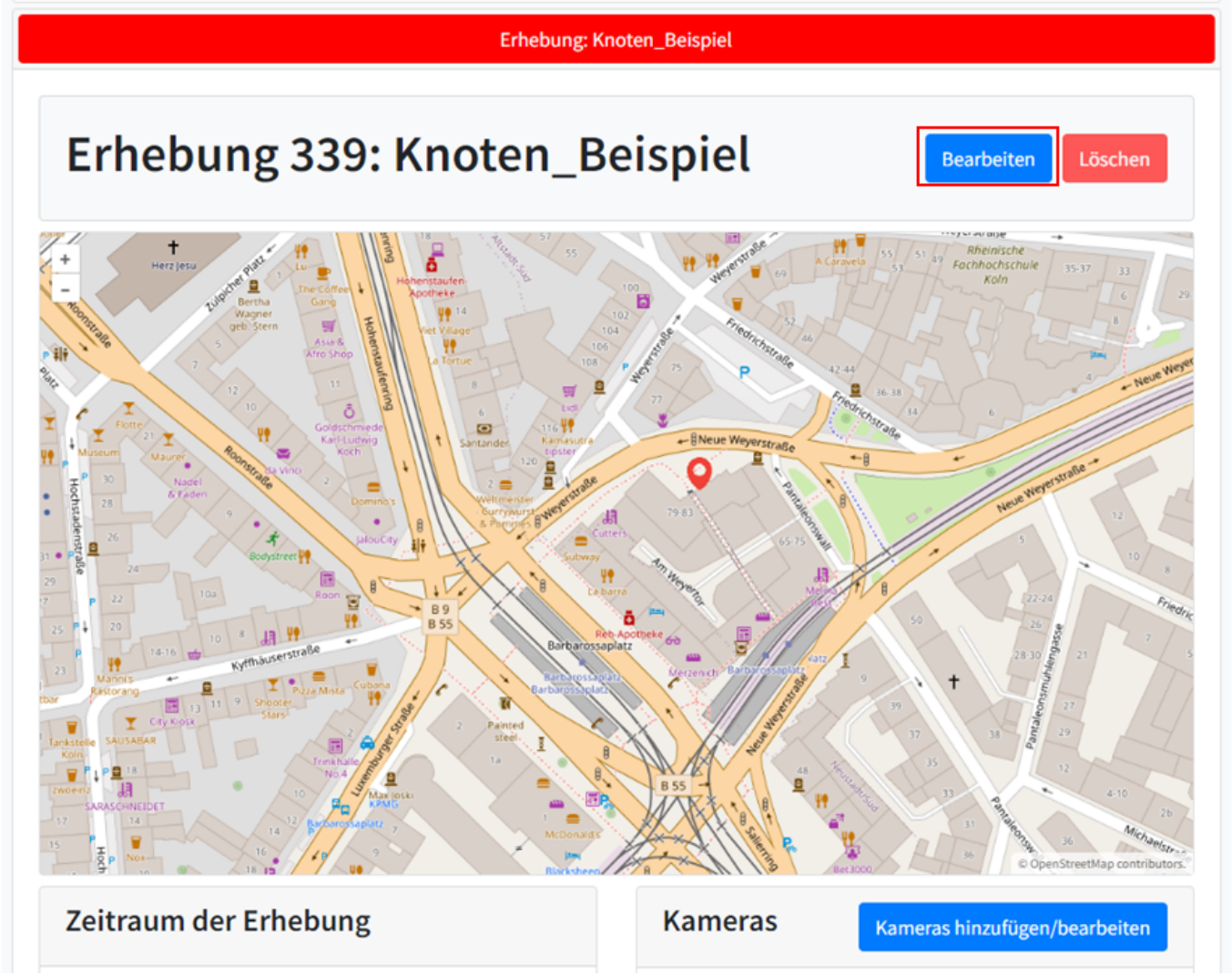


Figure 4: Editing interface of a selected survey in the Bernard Data Center

Definition of key data (location, date and class selection)

A window opens with the key data - name, start date, end date, location of the survey, time zone and types of road users (object classes) (see Figure 5). This key data can be defined step by step. The definition of the key data can be found in Table 1.

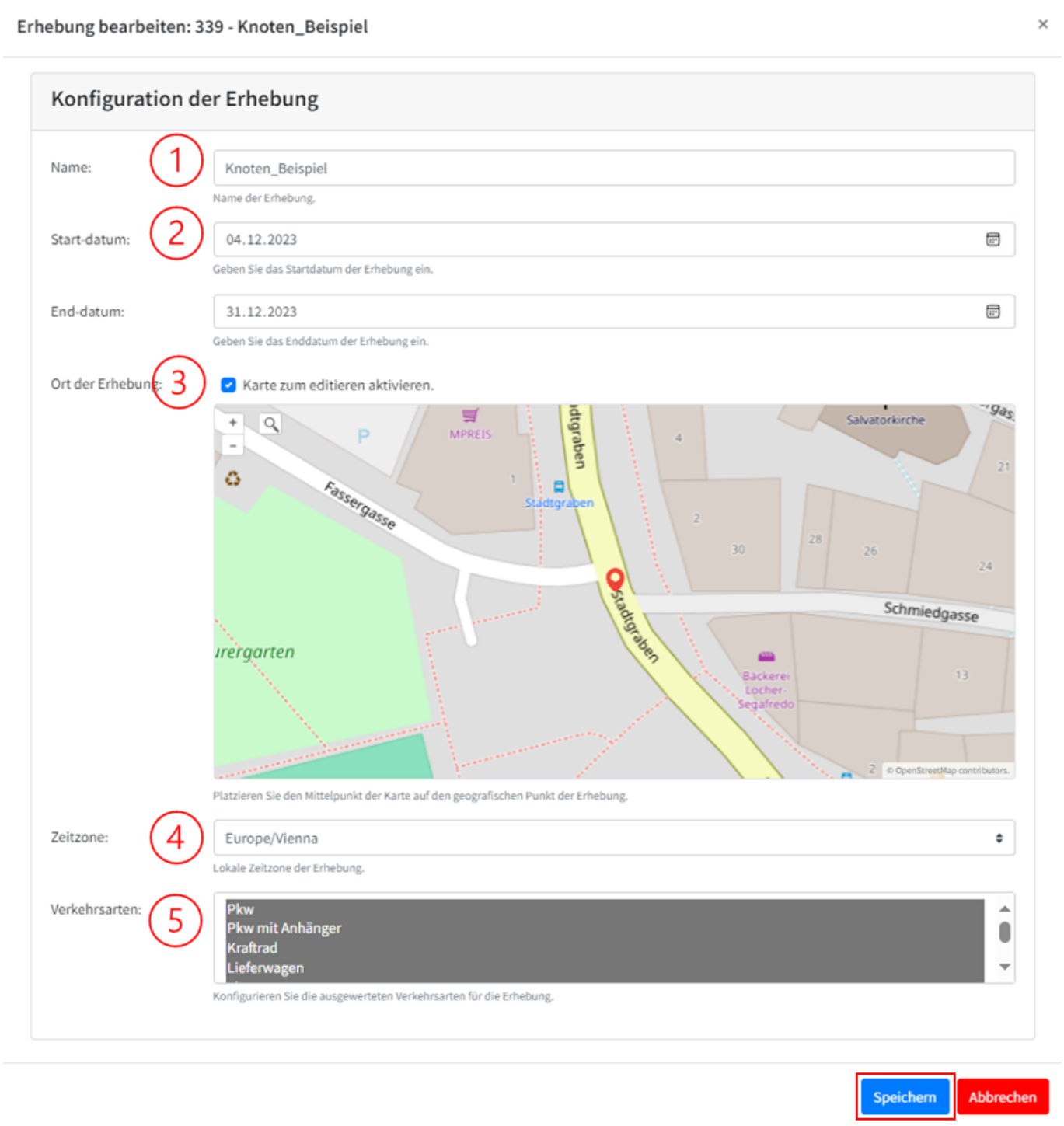


Figure 5: Configuration interface of a selected survey in the BERNARD Data Center for determining the key data

Table 1: Definition of the key data of a survey in the BERNARD Data Center.

Field	Description
1	Describes the name of the survey that you initially assigned when creating the survey. If required, the name of the survey can be edited in the corresponding field.

Field	Description
Name	 Note! As it is possible to filter the surveys by name, it is recommended to select an unambiguous name.
 Date	The start and end date defines the period for the data analysis. For the start and end date, 00:00 is automatically selected as the time, with the end date including the selected day. Example: A measurement on 01.01.2023 from 0:00 to 23:59 would therefore have 01.01.2023 as the start and end date.
 Location of the survey	In order to change the location on the map, the checkbox "Activate map for editing" must first be ticked. You can use the button with the magnifying glass to open a search bar in which you can enter the desired address. The location is defined by left-clicking the marker on the interactive map. To protect the location from changes, the "Activate map for editing" checkbox can be unchecked.
 Time zone	The time zone is set to the region "Europe/Vienna" by default. It is recommended to select the local time zone of the survey in the menu.
 Traffic types	The traffic types are the vehicle classes that are to be taken into account in the evaluation for this survey. By pressing the Ctrl key, several traffic types can also be selected for a single survey. In order to make the application possibilities of the evaluation more flexible, the selection of the survey can also be adjusted afterwards. If the desired traffic type does not appear, please contact customer service.

After successfully configuring the key data of the survey, save this process with the save button at the bottom right (see Figure 5).

Adding / editing of cameras

The next step is to assign the BMAs used to the survey. To do this, open the selection window (see Figure 7) by clicking on "Add/edit cameras" (see Figure 6).

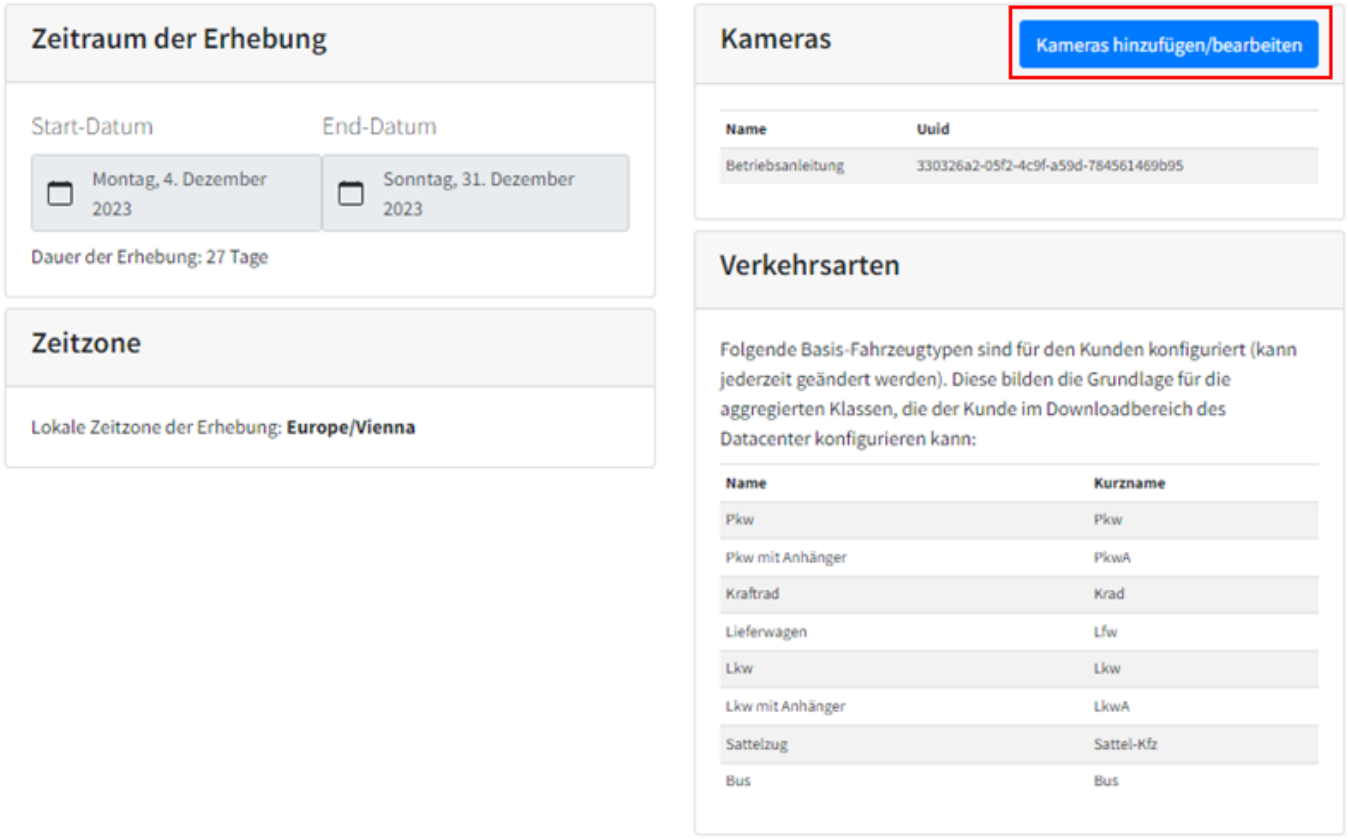


Figure 6: Adding a camera in the configuration interface

This is where you add all the BMAs that you use or have used for this survey. If you have several BMAs in use, you can filter by the name of the BMA, for example, to make it easier to find the BMA you are looking for in the selection field.

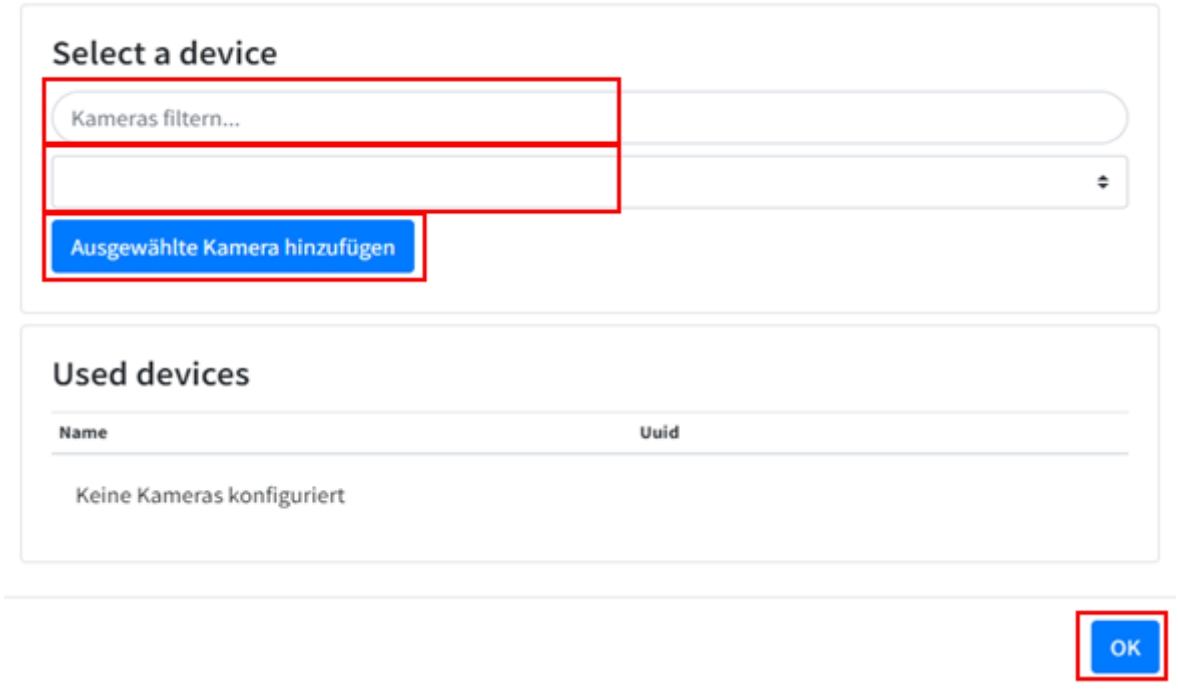


Figure 7: Selection window for specifying the BMAs in use

Once you have selected your BMA, click on "Add selected camera" and it will appear in the "Used devices" table (see Figure 7). If you do not wish to add any further BMAs for the configuration of this survey, save the selection by clicking OK.

Editing of the routes

In this step, the arms of the intersection are defined. To do this, click on the highlighted "Edit routes" button at the bottom right of the main interface in the "Configuration of the survey" area (see Figure 8).

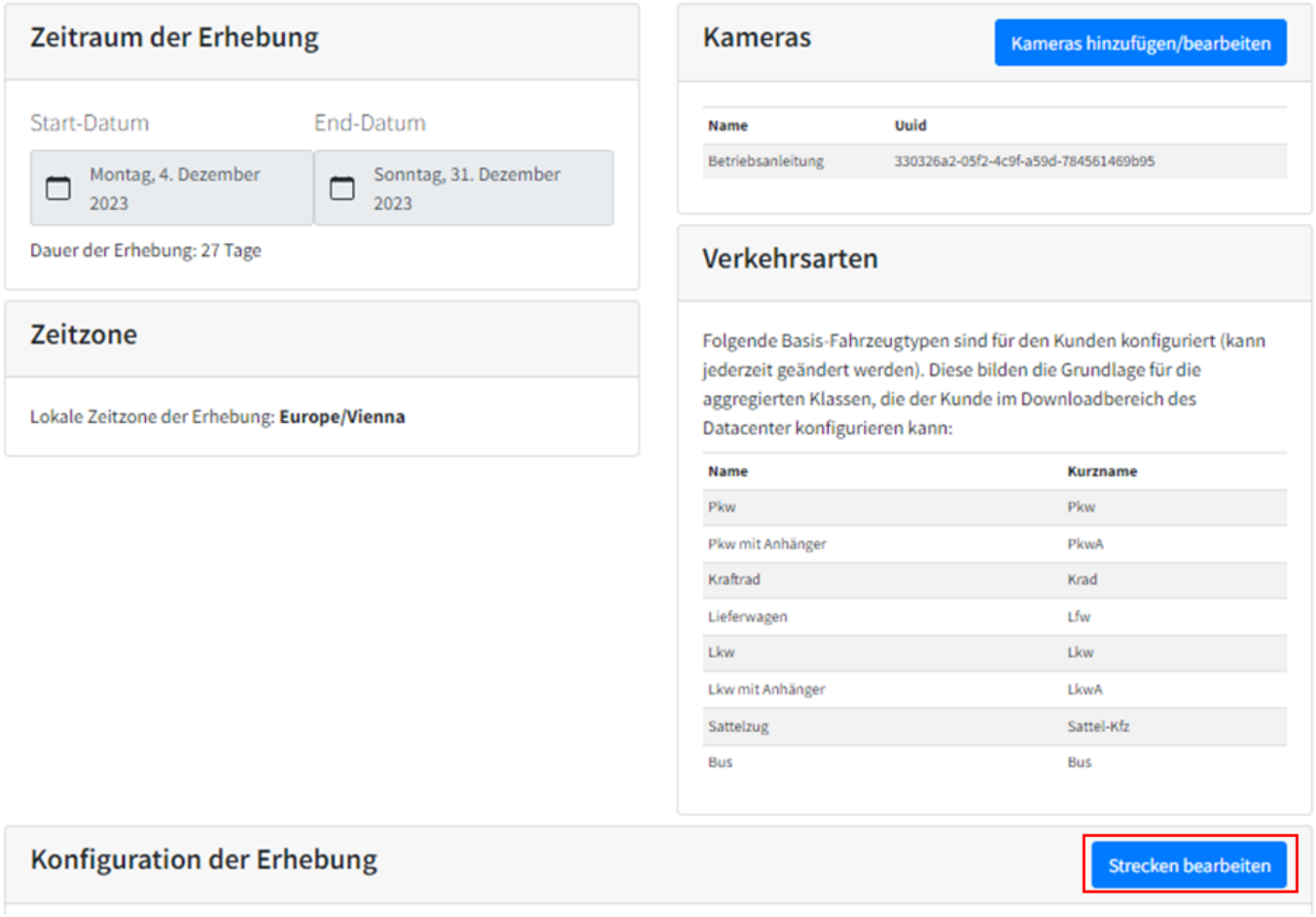


Figure 8: Editing the route in the configuration interface

The window for editing the routes then opens, in which the routes are named and the corresponding orientations are defined.

Configuration of the routes

The routes of the intersection are defined by name (see [6] in Figure 9), angle (see [7] in Figure 9) and directional traffic type (see [8] in Figure 9). By confirming the "Show angle help" checkbox, an angle help can be added to the map section as shown in Figure 9. The definition of the key data of the route (name [6], angle [7], direction [8] and crossing [9]) are listed in Table 2.

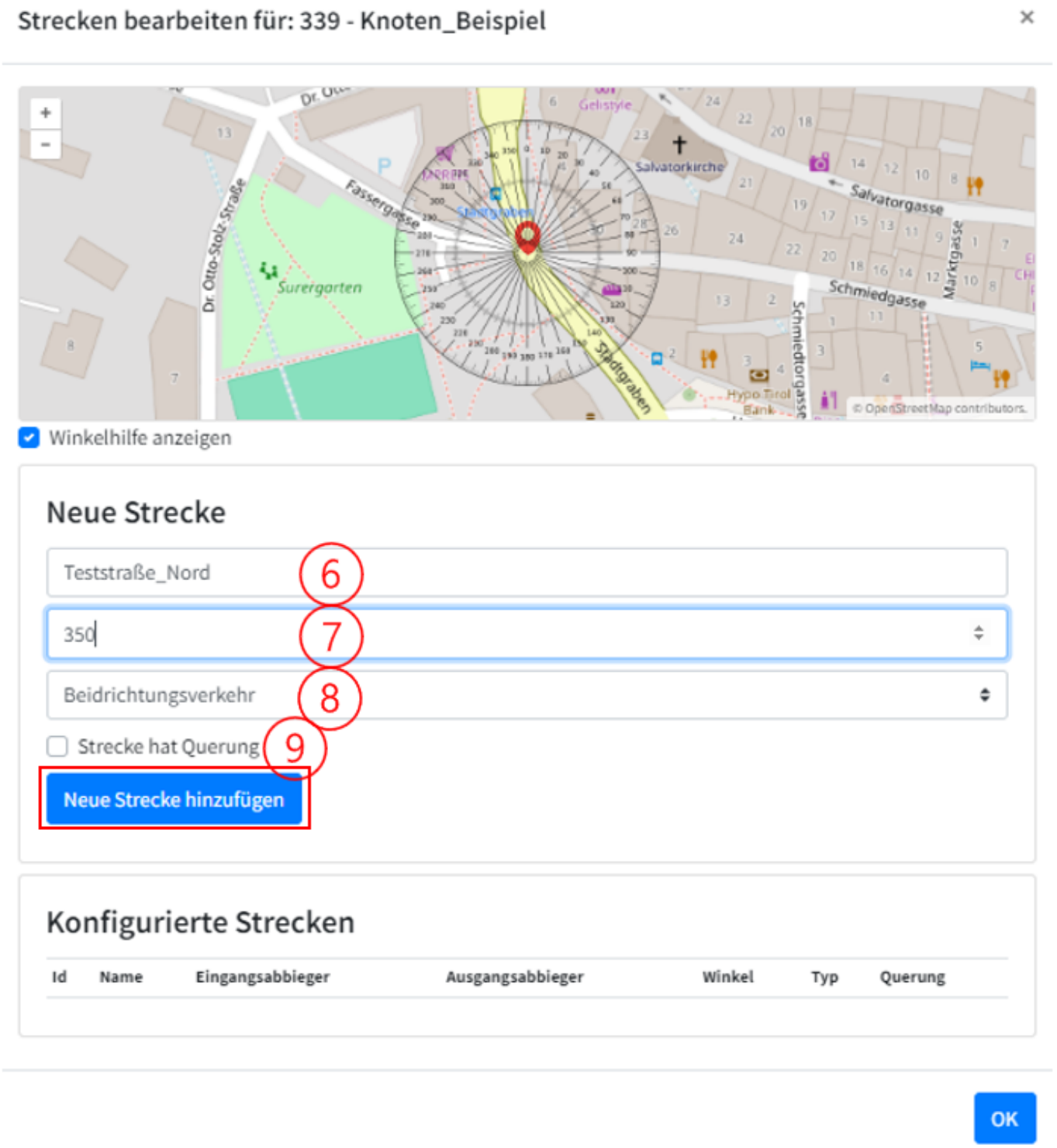


Figure 9: User interface for configuring the routes as individual intersections

Note:

Activate the angle help to read the exact angle from the north axis of the node to the route.

The selection "Route has crossing" can be made to include pedestrian crossings in the Excel evaluation. This is only possible if the crossing is defined by a Crossing Line in the Control Center. When selecting this option, an additional field opens which must be filled in. The corresponding Crossing Line used for counting the pedestrian crossings must be entered in this field. In the first line, enter the corresponding crossing using the corresponding UUID from the Control Center. In the second line, you can name the crossing as you wish. Then select which direction (In, Out) points clockwise or counterclockwise.



Figure 10: Crossing configuration window.

Table 2: Key data of a route

6 Name	The name of the route is defined in this field. This name appears both in the evaluation in the Data Center and in the excel file.
7 Angle	Determine the angle between the road and the intersection. To be able to read an angle, the angle help can be activated using the "Show angle help" checkbox. The center point of the intersection with the axis pointing north represents the zero axis.
8 Direction	Enter the direction of traffic of the route. Choose between: - Two-way traffic - Only road users approaching the intersection

- Only road users leaving the intersection

Note!

It is also possible to detect wrong-way drivers in a one-way road. In the case of one-way roads, for example, this can be specified as two-way traffic in order to output the traffic in both directions.

 Crossing	If you have added a Crossing Line for detecting pedestrian crossings during configuration in the Control Center, select this checkbox. The window then expands (see Figure 10). - Enter the corresponding crossing that you have configured - Name the crossing and note the direction in which the crossing is recorded

Once you have filled in the fields as shown in Figure 9 according to the definitions in Table 2, click "Add new route" to confirm the entry. Repeat the steps for defining the intersection for all routes at the intersection that you want to evaluate in the data center. As soon as all routes are listed, confirm your entry with "OK". (see Figure 11).

For each route, automatic origin destination flows are generated defined by their relations to all other routes (turning traffic, straight ahead traffic) and to the route itself (U-turn).

Configuration of turning movements / Definition of origin destination flows

In the last step of the configuration, you must define the origin destination flows and assign the corresponding zone/line IDs from the configuration in the Control Center to the origin destination flows.



Attention!

If you are working with several BMAs at one intersection, special care must be taken to ensure that origin destination flow is not stored with IDs of different BMAs.

Define the origin destination flow by selecting your route and clicking on the highlighted "Edit selected turning movement" button (see Figure 11) so that the user interface opens as shown in Figure 12. If the "Edit selected turning movement" field is highlighted in light blue, no origin destination flow has been selected. The individual key data of the selected origin destination flow is defined in Table 3 and must be configured according to their definition.

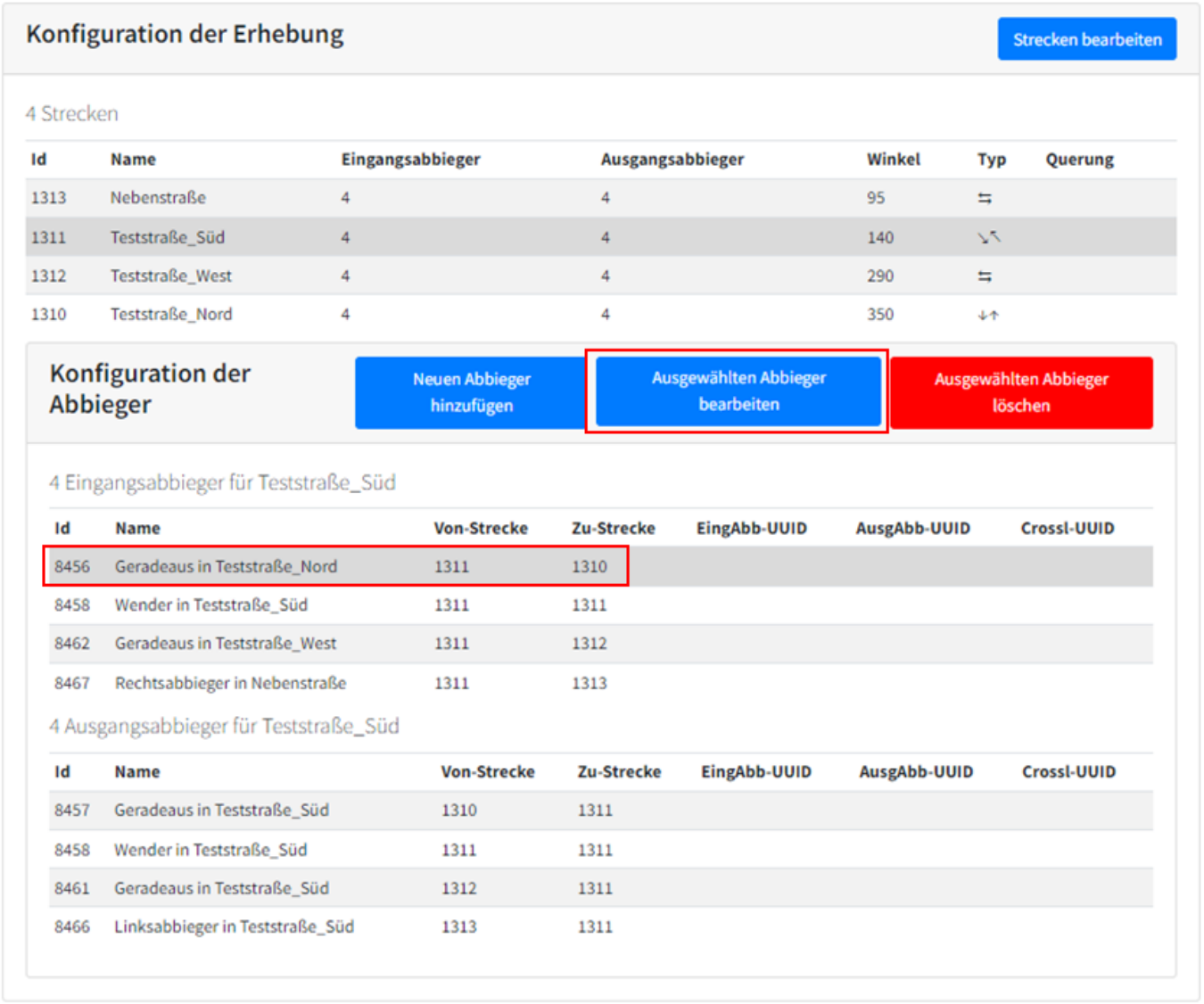


Figure 11: User interface with configured routes and automatically generated driving relationships

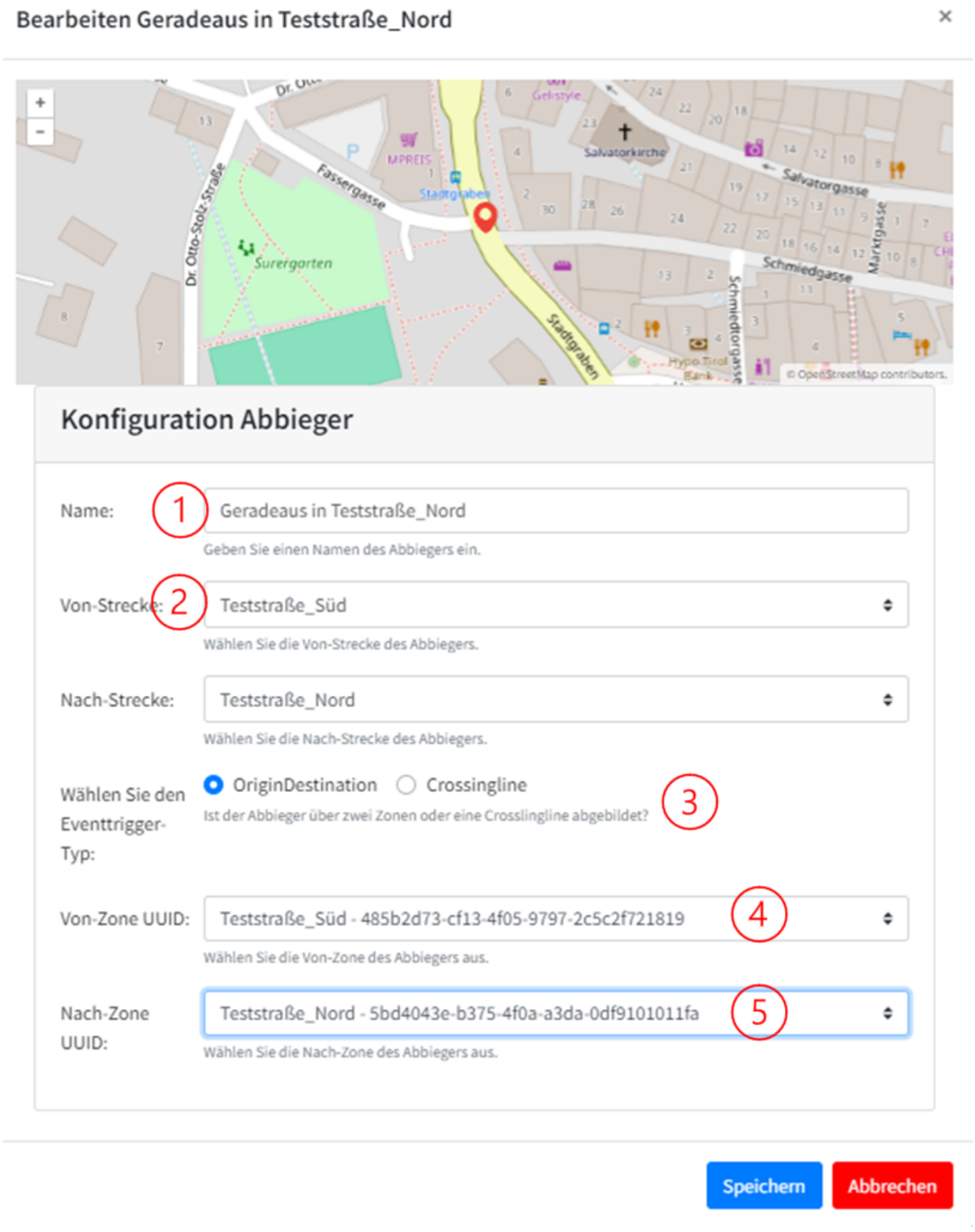


Figure 12: Configuration window for defining origin destination flows

Table 3: Definition of the configuration of individual key data of a turning movement.

1 Name	The name of the origin destination flow is generated for the automatically created origin destination flow with the names of the routes and relative orientation to each other (right turn, left turn and straight ahead). If required, you can edit the name in this field.
2 From route To route	"From route" is the route from which the route begins and the "To route" always describes the route where the route ends. The "From route" and "To route" are already defined in the automatically generated origin destination flows, so that they do not need to be changed if an automatically generated driving relationship is already configured. If you generate your own origin destination flow, you must select the "From route" and "To route" yourself according to the desired origin destination flow.
3 Event type	Choose between the event types with which you have recorded origin destination flow. If a Crossing Line (CL) was used to determine the origin destination flow during the configuration of the BMA the Crossing Line must be selected here. The UUID of the Crossing Line with the corresponding direction (in, out) is then selected. You can also activate the speed data option (this is optional).
4 From zone UUID	All zone UUIDs of the selected camera(s) are stored in the selection menu of the From zone, even if the counts have already been completed. Make your appropriate selection of the entry zone for the From zone of the respective origin destination flow. As a name for a zone can be assigned several times, it is recommended that the UUID of the selected zone is compared with the zone in the Control Center during configuration, as the UUID is unambiguous.
5 To zone UUID	Corresponding to the From zone, you can specify the appropriate UUID of the To zone where the origin destination flow ends.

Save the entry with the "Save" button at the bottom right.

Note!

If only one BMA is used and the from or to zone is always the same, a From or To zone only needs to be defined once in a driving relationship. The rest is added automatically.

Attention!

The automatic addition also takes place if several BMAs were used. In this case, the routes must be adjusted afterwards. The origin destination flows must be checked at the end.

Checking the configuration

At the end, all routes, angles and route assignments to the UUIDs must be checked again.

If there is an unambiguous zone assignment for each intersection arm, make sure that all "Input UUIDs" for entering turning movements are identical. The same applies to exiting turning movements. Here too, the "Output UUIDs" should be identical if the assignment is unambiguous (see Figure 13).

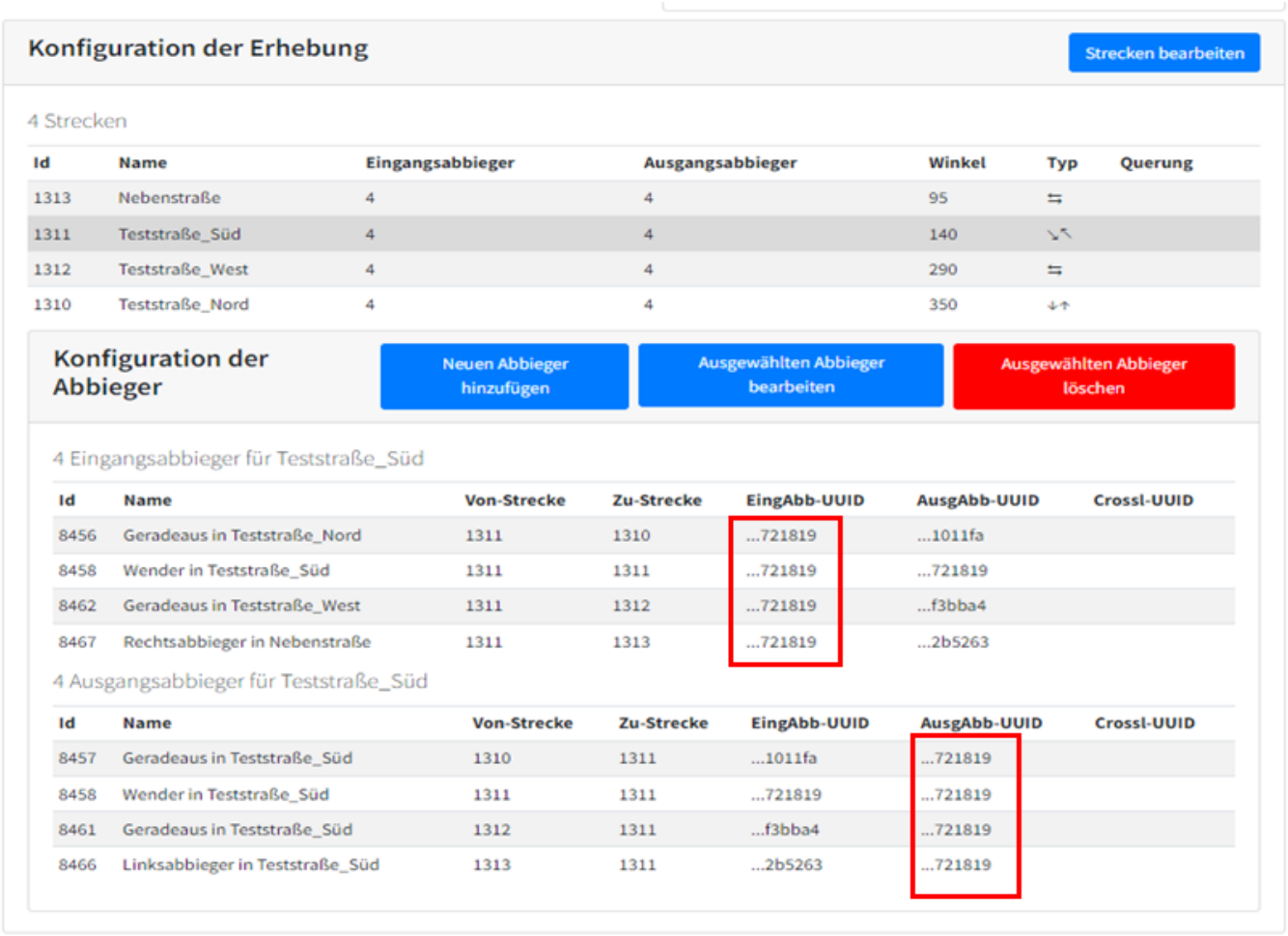


Figure 13: Result of a successful configuration of the origin destination flows of a survey in the BERNARD Data Center

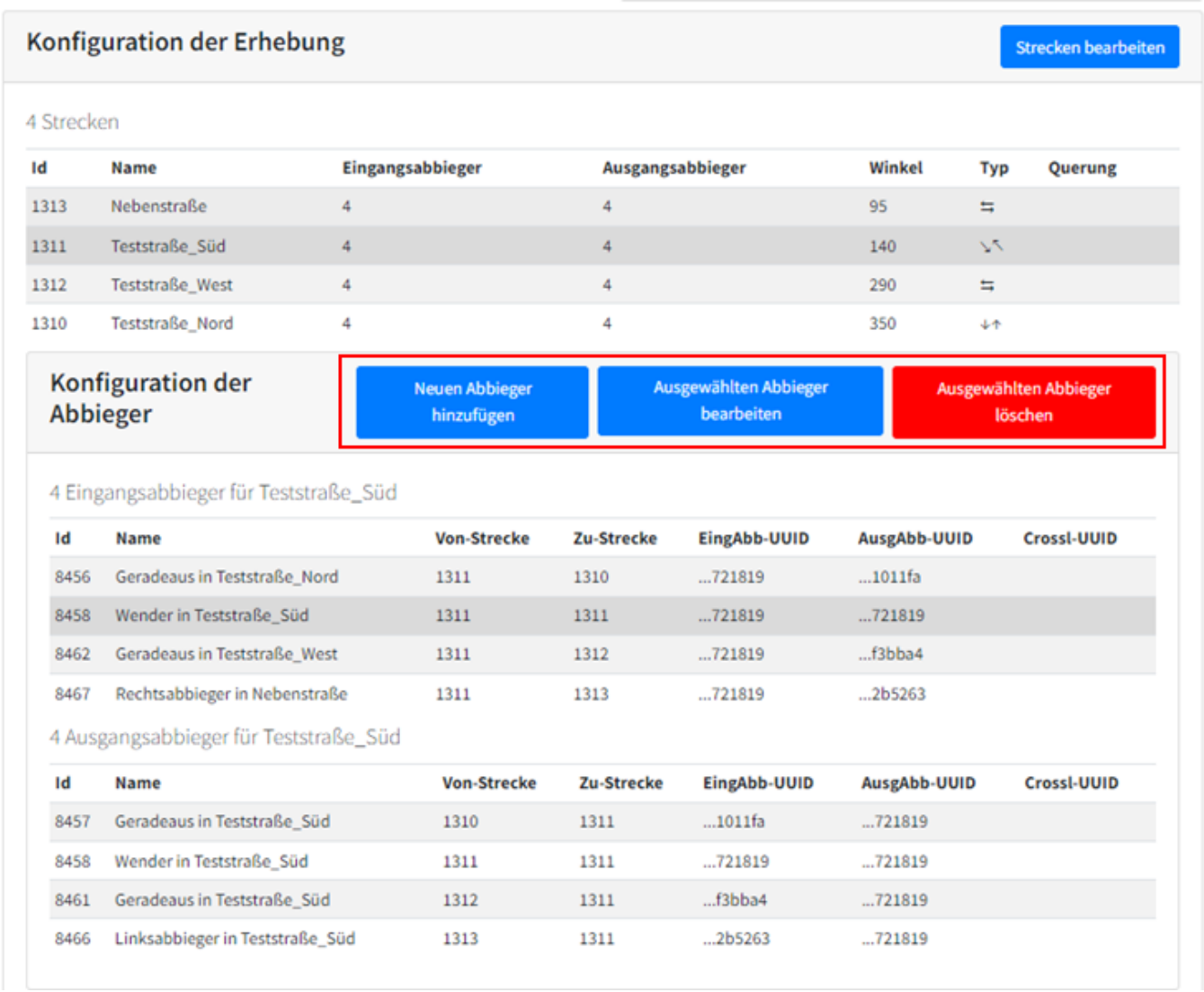
Note!

To check the configured intersection, it is advisable to view the turning movement counts in the Data Center at the same time. If the turning movement counts already reflect implausible values or the modal split is atypical, the configuration should be checked again.

Deletion and adding of origin destination flows

To delete an existing origin destination flow, the route from which the origin destination flow to be deleted originates must be selected. You can now select the origin destination flow that is no longer needed and delete it using the red "Delete selected turning movement" button.

To add a missing origin destination flow, select the initial route and click on the blue "Add new turning movement" button to open a new window for configuring the origin destination flow. The origin destination flow can be defined as described in Configuration of turning movements / Definition of origin destination flows.



Id	Name	Eingangsabbieger	Ausgangsabbieger	Winkel	Typ	Querung
1313	Nebenstraße	4	4	95	⇄	
1311	Teststraße_Süd	4	4	140	↘↖	
1312	Teststraße_West	4	4	290	⇄	
1310	Teststraße_Nord	4	4	350	↓↑	

Id	Name	Von-Strecke	Zu-Strecke	EingAbb-UUID	AusgAbb-UUID	Crossl-UUID
8456	Geradeaus in Teststraße_Nord	1311	1310	...721819	...1011fa	
8458	Wender in Teststraße_Süd	1311	1311	...721819	...721819	
8462	Geradeaus in Teststraße_West	1311	1312	...721819	...f3bba4	
8467	Rechtsabbieger in Nebenstraße	1311	1313	...721819	...2b5263	

Id	Name	Von-Strecke	Zu-Strecke	EingAbb-UUID	AusgAbb-UUID	Crossl-UUID
8457	Geradeaus in Teststraße_Süd	1310	1311	...1011fa	...721819	
8458	Wender in Teststraße_Süd	1311	1311	...721819	...721819	
8461	Geradeaus in Teststraße_Süd	1312	1311	...f3bba4	...721819	
8466	Linksabbieger in Teststraße_Süd	1313	1311	...2b5263	...721819	

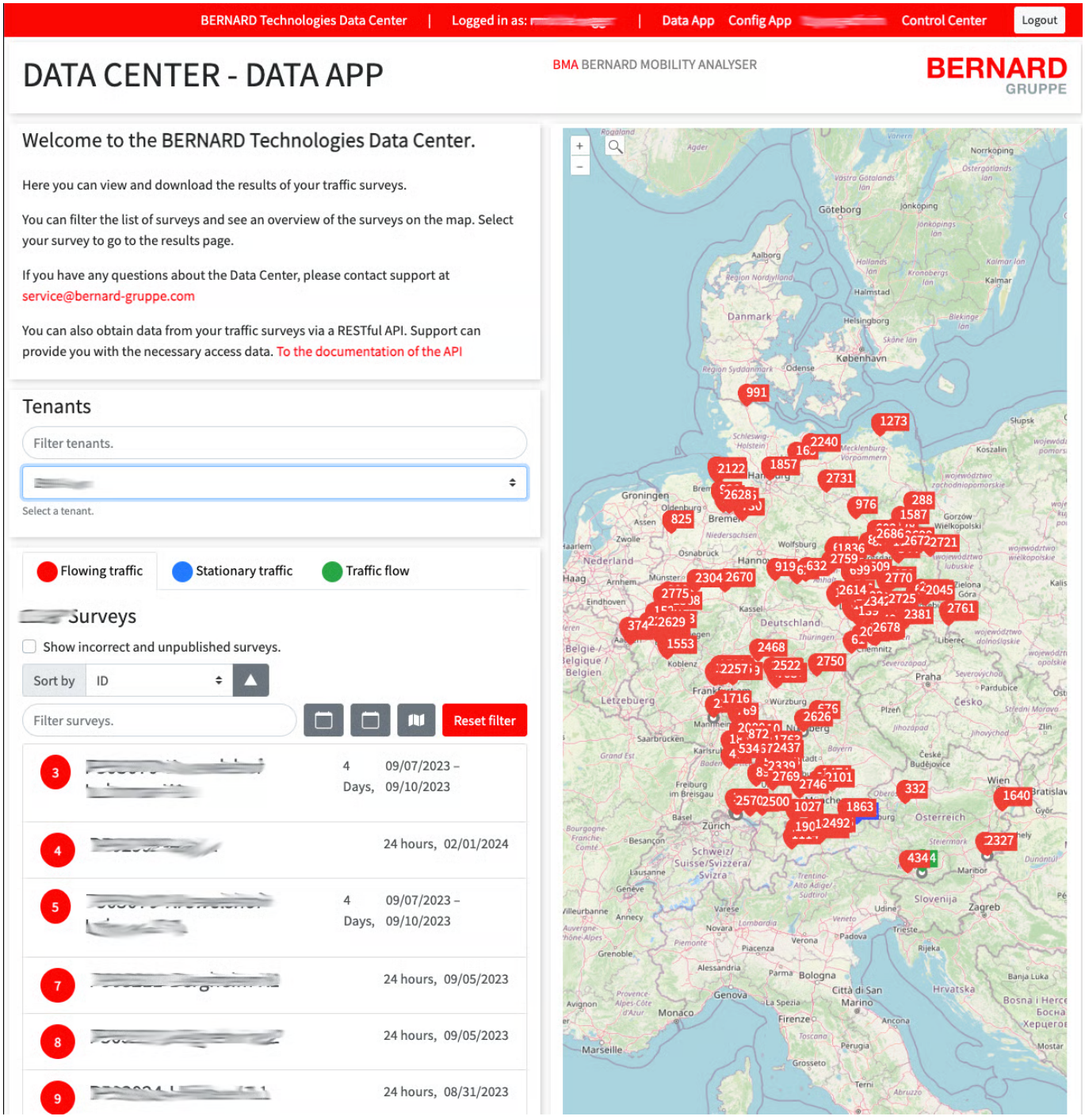
Figure 14: Add/edit/delete turning movement

Note!

If a new origin destination flow is added, its "From route" and its "To route" must be defined individually.

Data analysis

Once the survey has been created and configured, it can be viewed in the Data App of the Data Center.



Select the corresponding tenant to which your survey has been assigned. To make it easier to find the survey you are looking for, you can filter the surveys by name, the survey period (start and end date) and the selected map section.

In the Data Center, you have the following functions to gain insights from a traffic count.

- Overview of the traffic count
- Daily traffic distribution
- Evaluation
- Weather data
- Turning movement counts
- Download the traffic count data

Overview of the survey

In the Data Center you will find an overview of the BMAs in use, the evaluated traffic object classes, the period of the survey and the resulting duration of the survey, the time zone set for the survey and the location of the survey (see Figure 16).

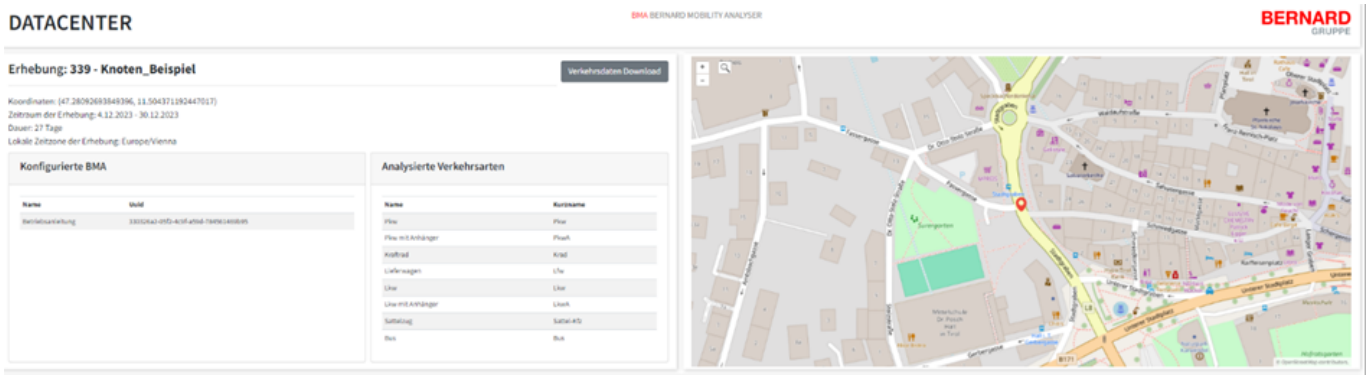


Figure 16: User interface in the BERNARD Data Center of a survey with the configured key data of the evaluation

Daily traffic distribution

You can have the daily traffic distribution evaluated for different days, which you can select in the calendar in the "Day for graphs" window.

In addition, the daily traffic distribution can be evaluated for different object classes. To do this, you must select or deselect the relevant object classes in the "Displayed object classes and grouping" window.

The daily traffic distribution can also be output for a specific time window on the selected day. To filter for the desired times, click on the start time and drag the mouse to the end time of the time slot while holding down the button. Use the reset button to extend the time slot to the whole day again.

The calculated daily traffic distribution can be downloaded in .svg, .png and .csv format by clicking on the download button.

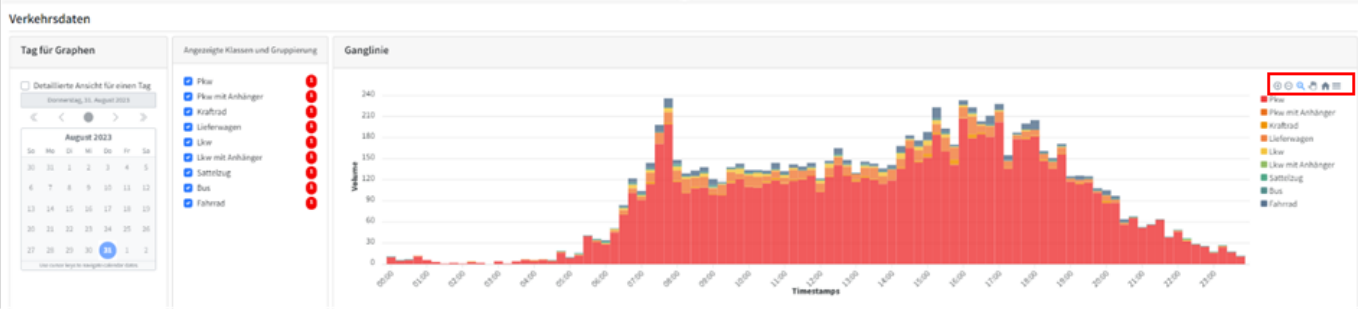


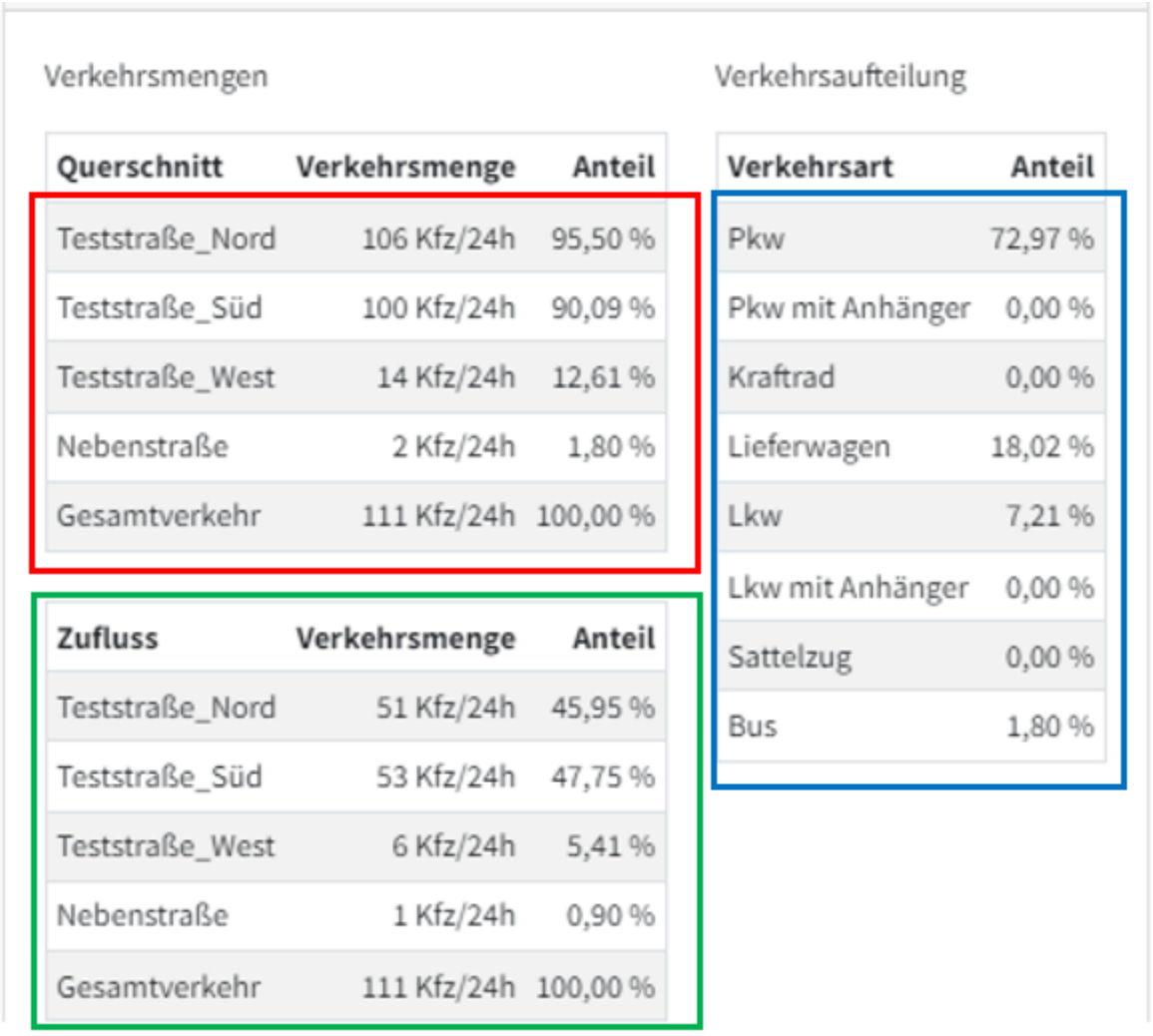
Figure 17: Visualization of the daily traffic distribution of the configured survey

Evaluation

The total traffic volume for each defined intersection arm can be read in the "Evaluation" window. Based on the total traffic at the intersection , the relative modal split at the individual intersections arms is also calculated.

In addition, the inflow for each intersection arm into the intersection is output and its total traffic volume in the intersection is calculated.

In addition to this evaluation of the traffic volume, the modal split is analyzed by calculating modal split for each object class in relation to the total traffic volume



Verkehrsmengen

Querschnitt	Verkehrsmenge	Anteil
Teststraße_Nord	106 Kfz/24h	95,50 %
Teststraße_Süd	100 Kfz/24h	90,09 %
Teststraße_West	14 Kfz/24h	12,61 %
Nebenstraße	2 Kfz/24h	1,80 %
Gesamtverkehr	111 Kfz/24h	100,00 %

Zufluss	Verkehrsmenge	Anteil
Teststraße_Nord	51 Kfz/24h	45,95 %
Teststraße_Süd	53 Kfz/24h	47,75 %
Teststraße_West	6 Kfz/24h	5,41 %
Nebenstraße	1 Kfz/24h	0,90 %
Gesamtverkehr	111 Kfz/24h	100,00 %

Verkehrsaufteilung

Verkehrsart	Anteil
Pkw	72,97 %
Pkw mit Anhänger	0,00 %
Kraftrad	0,00 %
Lieferwagen	18,02 %
Lkw	7,21 %
Lkw mit Anhänger	0,00 %
Sattelzug	0,00 %
Bus	1,80 %

Figure 18: Evaluation of the traffic volume for each intersection with its share of total traffic volume (area marked in red), inflow from each intersection arm into the intersection (area marked in green), and modal split for each object class in relation of the total traffic volume (area marked in blue)

Weather data

To better analyze the traffic volume, the weather data for the selected day is retrieved and displayed in the "Day for graphs" window (see Figure 19).



Figure 19: Weather data to help interpret the sensor data for the selected day in the "Day for graphs" window

Turning movement counts

Turning movement counts are generated in the corresponding window for the selected period and the selected object classes of the daily traffic distribution (see Daily traffic distribution) (see Figure 20). Above the defined name, the total inflow into the intersection is shown in bold, and the outflow is shown below the line. The distribution of inflows and outflows from and to the individual intersection arms can be found below and above the total number.

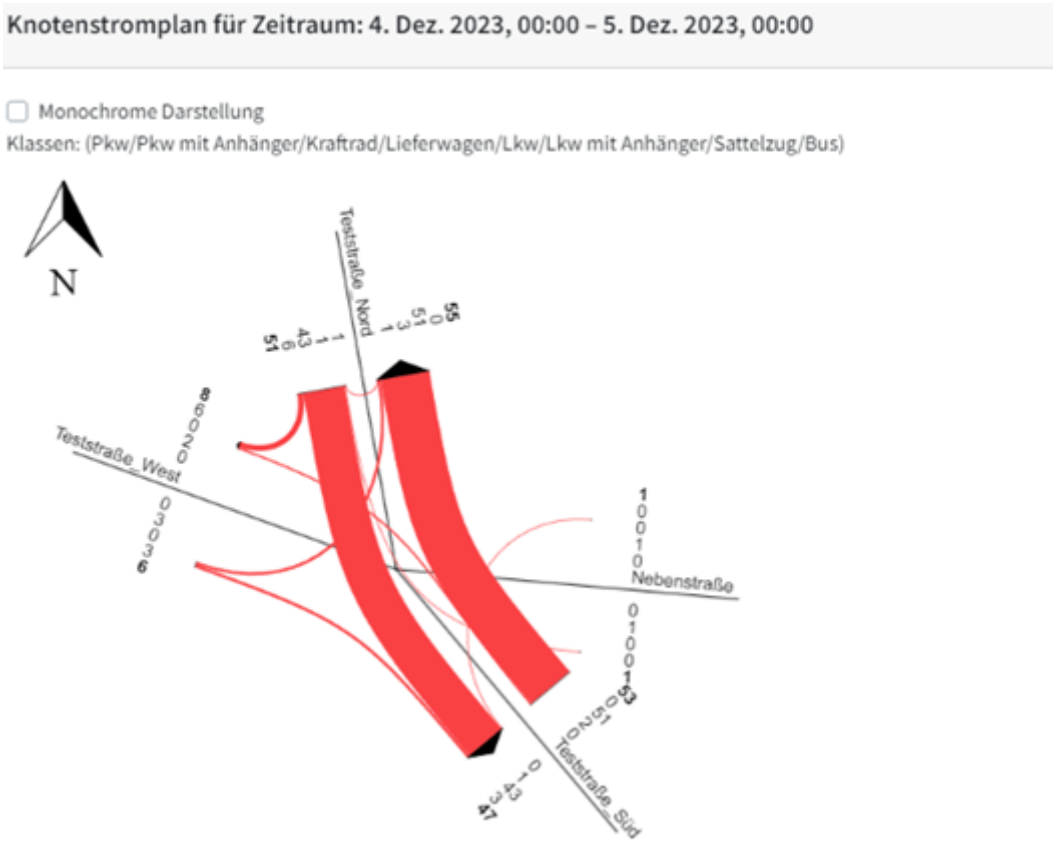


Figure 20: Turning movement counts for the selected period and the selected object classes

Attention!

If no arrow is shown between the individual route arms, this may mean that this origin destination flow has not yet been configured or that no objects have been detected that fulfill the existing configuration. The configuration should therefore be checked - and adjusted if necessary.

Download the analysis file

The "Download traffic data" button in the survey overview takes you to the download view (see Figure 21).

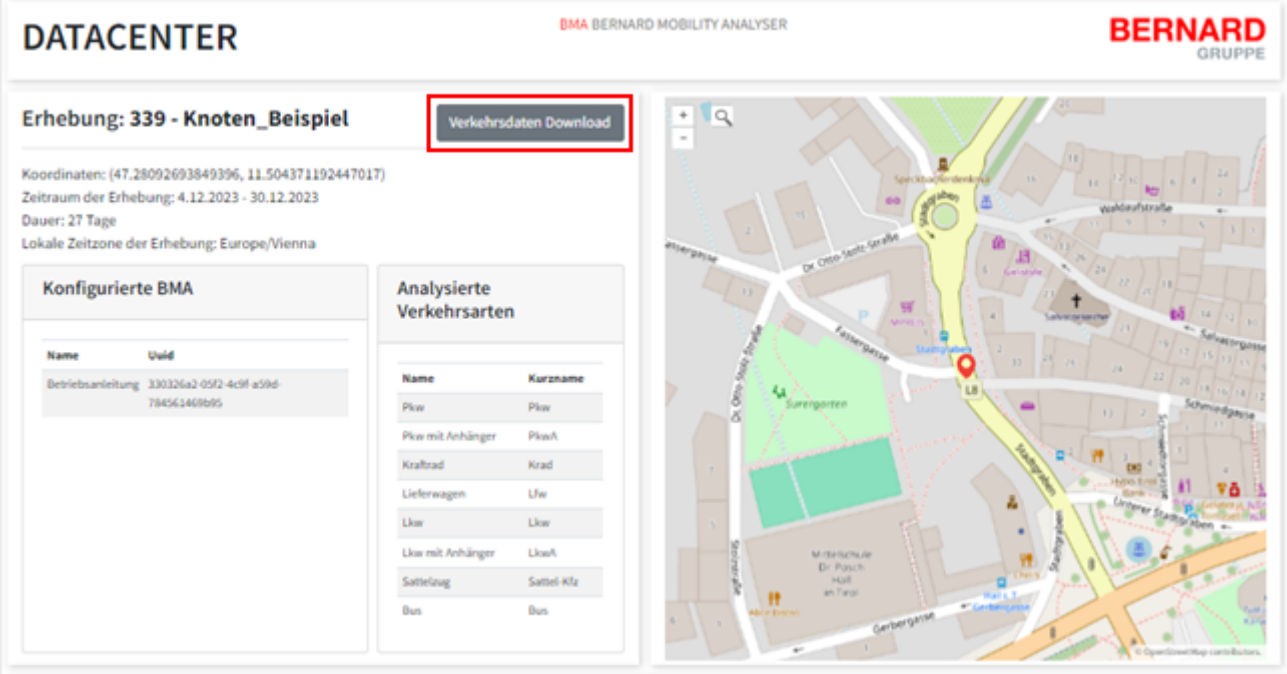


Figure 21: Traffic data download

In the download view, which is shown in Figure 22, you have the option of selecting the time resolution of the measurement data in the evaluation file to be downloaded. You can also divide the evaluation classes into any number of combined classes. It is not possible to exclude individual object classes that were defined during the survey. If individual object classes are not to be included in the Excel evaluation, this must be adjusted in the configuration.

Finally, the date of the Excel evaluation must be specified. You can only select a date within the survey period. If you download the measurement data for several days at the same time, you have the option of downloading individual data records per day or a bundled .zip file with all days.

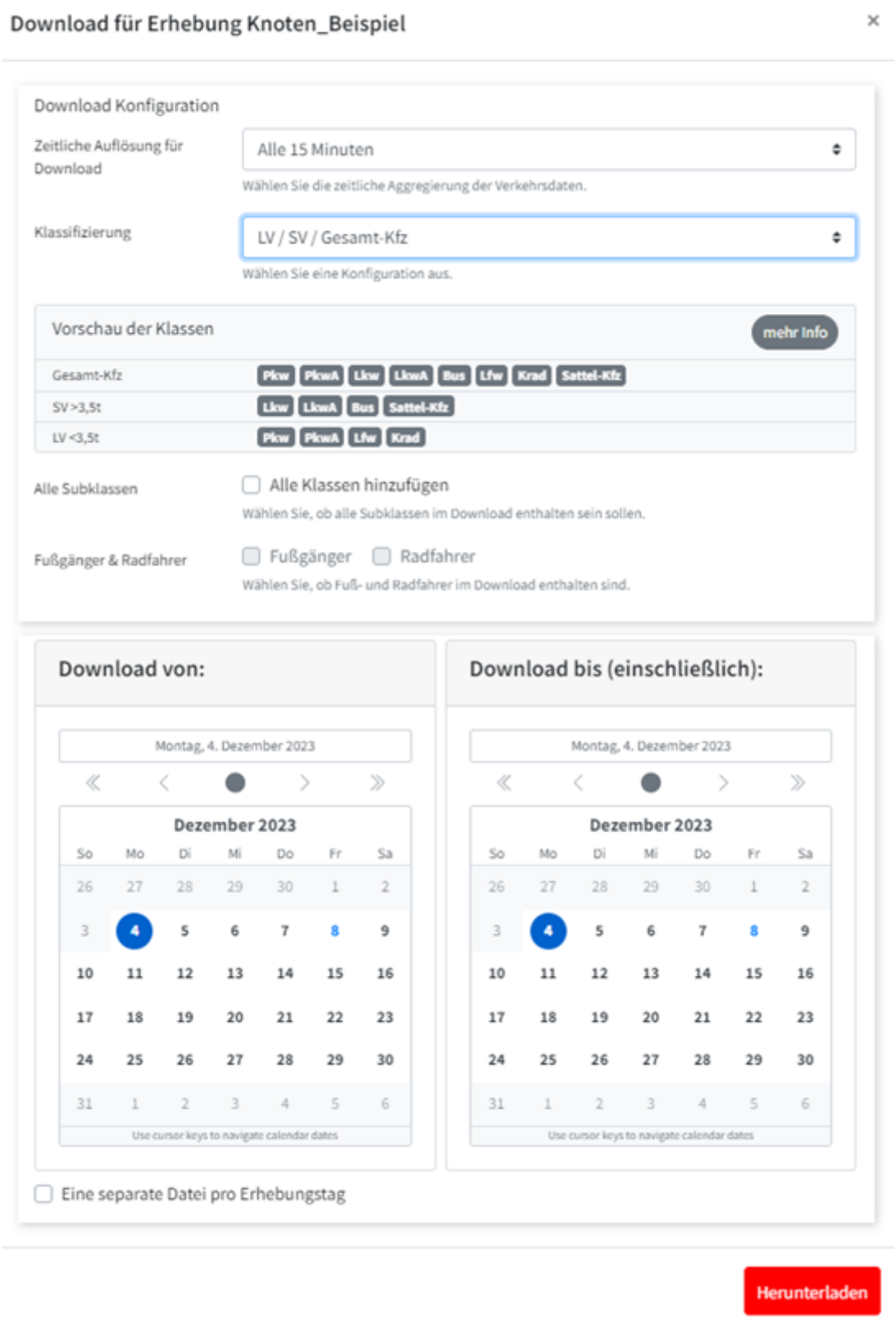


Figure 22: Download view of the analysis file(s)

Evaluation file

The evaluation file is an Excel file consisting of several tables that cover the individually configured object classes on the one hand and contain the configured summarized object classes on the other hand. There is also a table with an explanation of the evaluation file. If crossings have been configured for routes, these are created in a separate spreadsheet with all the crossings created.

By default, the entire 24 hours of the selected day are analyzed in the evaluation file.

Lines 1 to 8 have the structure shown in Figure 23. The key data of the survey (name of the survey, counting date, start time and location) is documented and the measurement data in the table is analyzed with regard to the variables "day peak", "morning peak", "evening peak", "day traffic" and "night traffic".

Name der Erhebung	Knoten_Beispiel					
Zähldatum	Mon, 04. Dec 2023					
Startzeit	00:00		von	bis	Wert	Spitzenzeit
Standort	(47.281,11.504)	Tagesspitze	00:00	23:59	1157	12:00-13:00
		Morgenspitze	06:00	10:00	1076	08:15.09:15
		Abendspitze	15:00	19:00	869	17:15-18:15
		Tagesverkehr	06:00	22:00	1157	12:00-13:00
		Nachtverkehr	22:00	06:00	0	00:00-01:00

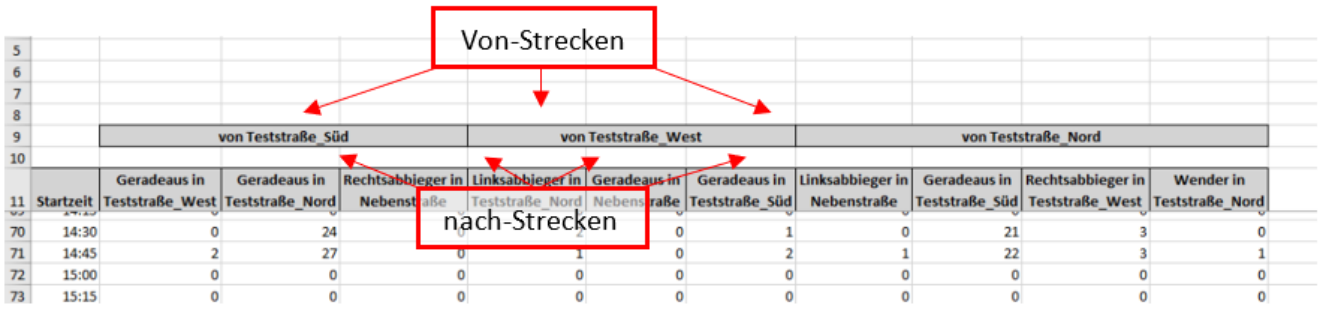
Figure 23: Header of the Excel analysis with the key data in measurement

Attention!

In order for the calculated values to be displayed correctly in the evaluation file, you must activate editing in the evaluation file.

The measurement data collected for the individual origin destination flows are listed below the key data. Line 9 contains the respective From-route for the origin destination flows, which is fully defined by the respective To-Route in line 11.

In the columns "Interval" and "Total hour", the total traffic load for the respective hour and for the respective interval - which corresponds to the time resolution of the measurement - is calculated. The hourly total is the sum of the subsequent hour for the start time, which is in the same row.



		von Teststraße_Süd			von Teststraße_West			von Teststraße_Nord			
11	Startzeit	Geradeaus in Teststraße_West	Geradeaus in Teststraße_Nord	Rechtsabbieger in Nebenstraße	Linksabbieger in Teststraße_Nord	Geradeaus in Nebenstraße	Geradeaus in Teststraße_Süd	Linksabbieger in Nebenstraße	Geradeaus in Teststraße_Süd	Rechtsabbieger in Teststraße_West	Wender in Teststraße_Nord
70	14:30	0	24	0	0	0	1	0	21	3	0
71	14:45	2	27	0	1	0	2	1	22	3	1
72	15:00	0	0	0	0	0	0	0	0	0	0
73	15:15	0	0	0	0	0	0	0	0	0	0

Figure 24: Excel evaluation of the configured origin destination flow for the selected survey

In the rows below the 24-hour measurement data, the variables "Total", "Day peak", "Morning peak", "Evening peak", "Day traffic" and "Night traffic" are defined for each origin destination flow (see Figure 25).

Gesamt	0	4390	1032	2297	2127	0
Tagesspitze 16:15-17:15	0	402	88	238	176	0
Morgenspitze 07:15-08:15	0	396	44	77	119	0
Abendspitze 16:15-17:15	0	402	88	238	176	0
Tagesverkehr 16:15-17:15	0	402	88	238	176	0
Nachtverkehr 22:00-23:00	0	83	10	61	50	0

Figure 25: Determination of the variables "Total", "Daily peak", "Morning peak", "Evening peak", "Daily traffic" and "Night traffic" for each origin destination flow

In the columns next to the 24-hour measurement data, inflows and outflows from and to the intersections arms as well as the total traffic volumes of the individual intersection arms for the selected time interval are determined for each intersection arm (see Figure 26).

Nebenstraße			Teststraße_Süd			Teststraße_West			Teststraße_Nord		
Fahrtrichtung West	Fahrtrichtung Osten	Q	Fahrtrichtung Nord-West	Fahrtrichtung Süd-Ost	Q	Fahrtrichtung Osten	Fahrtrichtung West	Q	Fahrtrichtung Süd-Ost	Fahrtrichtung Nord-West	Q
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	24	22	46	3	3	6	24	26	50
1	1	2	29	25	54	3	5	8	27	29	56

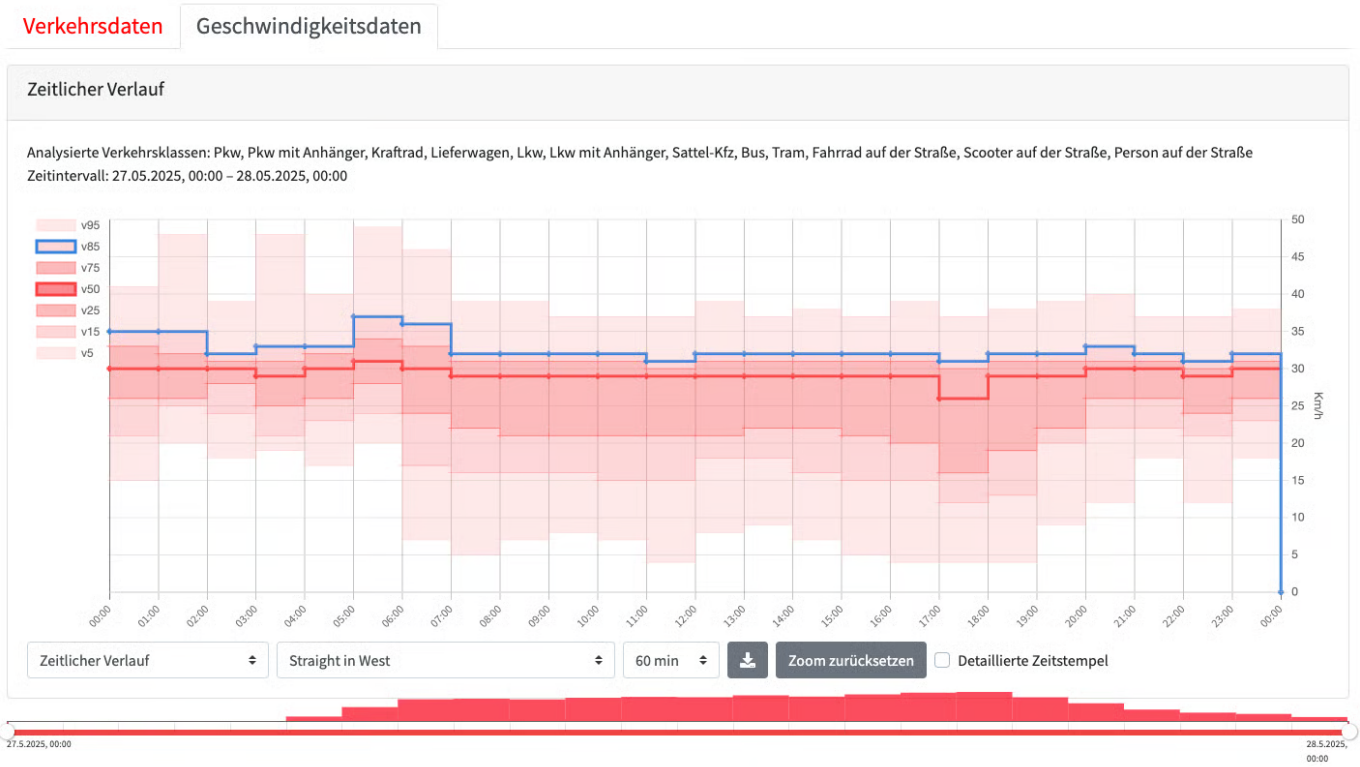
Figure 26: Determination of the inflows and outflows from and to the intersections arms as well as the total traffic volumes in the intersection arms.

Speed Data

Speed data is used for the analysis and visualization of vehicle speeds for a selected turning movement. This turning movement must be configured accordingly to display speeds.

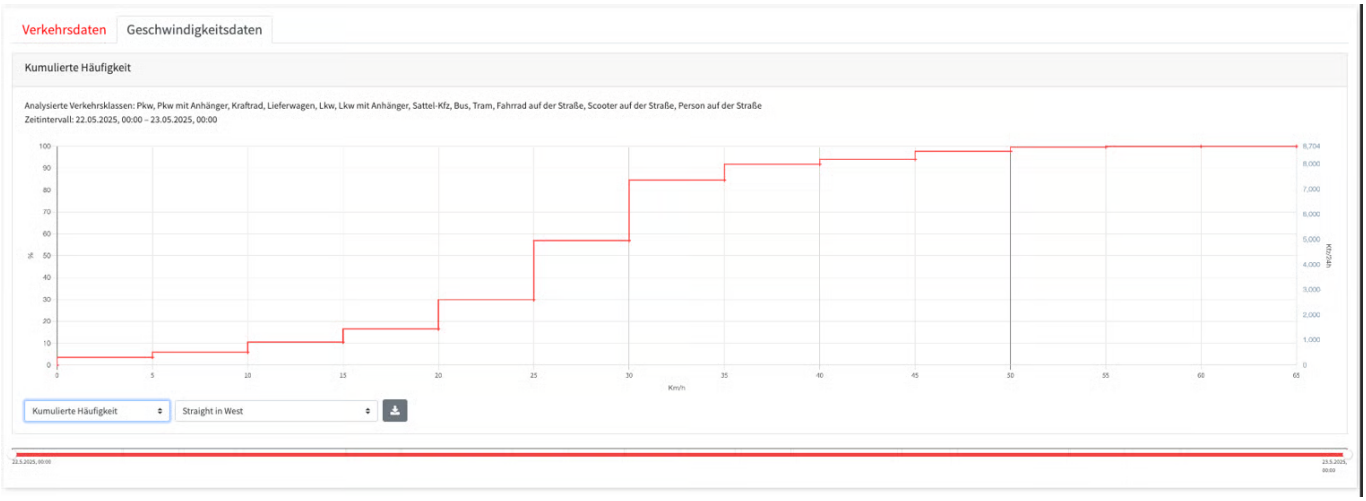
Temporal Progression

This module shows the **temporal progression of estimated vehicle speeds** for the following percentiles: 5%, 15%, 25%, 50% (Median), 75%, 85% (v85), 95%. This data can be filtered by time using the red slider at the bottom, and by class using the toolbar on the left.



Cumulative Distribution

This module shows the **cumulative frequency of speeds** over the observed period. Here, too, the data can be filtered by time and by class.


Verkehrsdaten
Geschwindigkeitsdaten
Kumulierte Häufigkeit
Analysierte Verkehrsklassen: Pkw, Pkw mit Anhänger, Kraftrad, Lieferwagen, Lkw, Lkw mit Anhänger, Sattel-Kfz, Bus, Tram, Fahrrad auf der Straße, Scooter auf der Straße, Person auf der Straße
Zeitintervall: 22.05.2025, 00:00 – 23.05.2025, 00:00
Km/h
Kumulierte Häufigkeit
Straight in West

Parking – Overview

The Parking module in the Data Center supports two survey types:

- **Entry/exit balancing**: Vehicles are detected at entrances and exits. The current occupancy is derived from entries and exits. Large parking areas can be covered with a few BMAs. Ideal for parking areas with defined entry/exit points. This variant requires automatic and manual calibration, as deviations otherwise accumulate over time.
- **Single-space detection (analysis of each space state)**: Each parking space is monitored individually using configured Regions of Interest (ROIs) and shown as free or occupied. Ideal for open parking areas or for identifying free spaces for e-mobility, for example. No calibration is required.

Method	Typical Use Cases	Calibration	Number of BMA/cameras
Entry/exit balancing	Parking garages, barrier-controlled parking	automatic + manual required	Few, all entrances/exits must be covered
Single-space detection	Open parking areas, guidance systems for individual spaces	not required	High, coverage of all monitored spaces via BMA/camera

Both methods can be configured and analyzed in the Data Center and can also be combined.

Survey Configuration

Configuration of parking surveys

After successfully installing and configuring the BMA, open your web browser and enter:

https://datacenter.bernard-gruppe.com

On this website, you can log in using your customer account. If you experience login issues or have forgotten your password, customer support can assist you. After logging in, the user interface appears.

To create a survey, open the **Config App** tab in the top-right of the menu bar.

Selecting the Tenant

Next, select the desired tenant to proceed with the configuration. Tenants allow you to group surveys. If you require more than one tenant, please contact customer support. After selecting a tenant, a list of already created surveys appears.

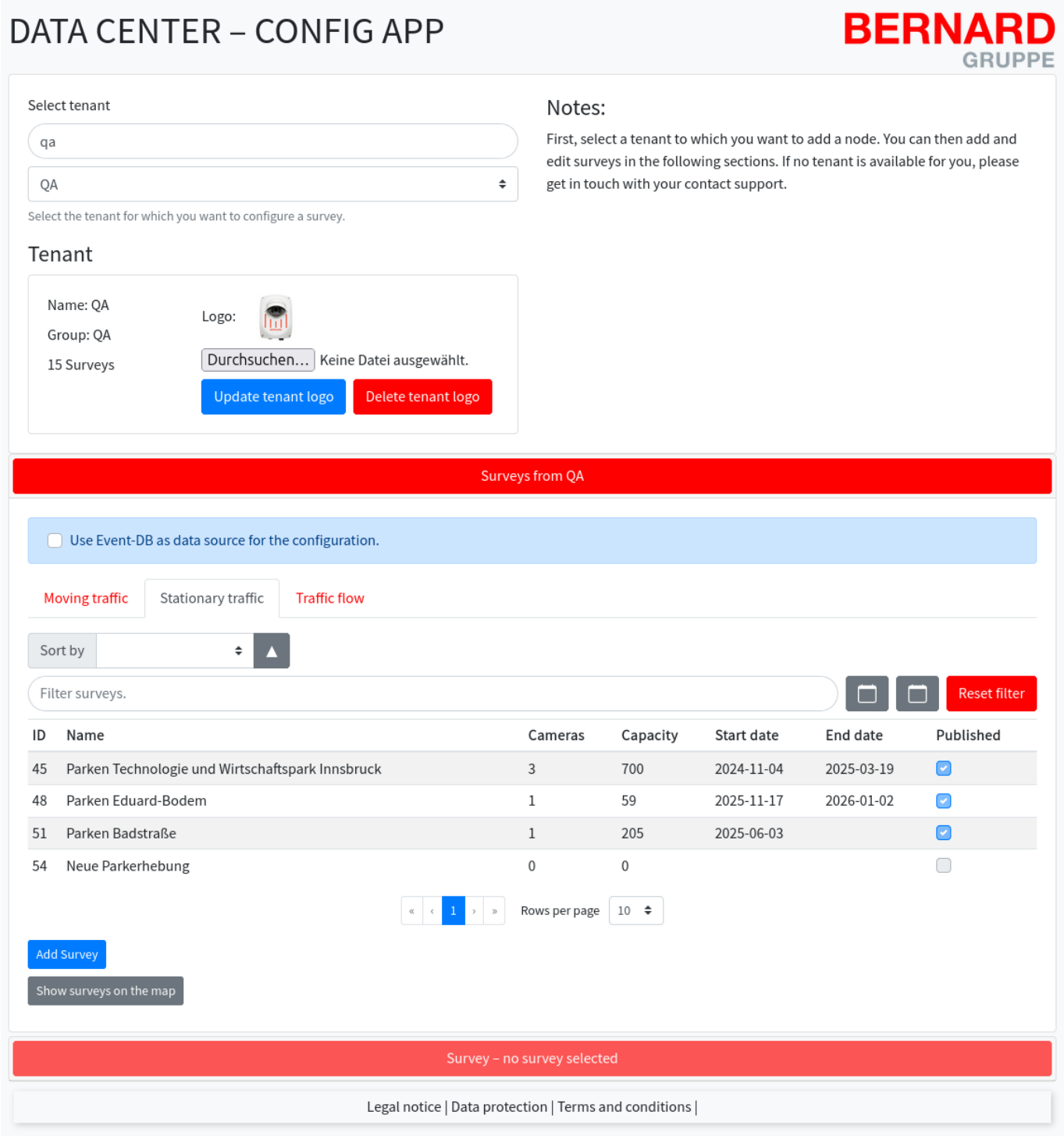


Figure: Data Center list of surveys for the selected tenant

You can filter surveys by date or text content. It is recommended to choose the survey name so it can be easily found later and, if needed, grouped via the text filter (for example, location or project number).

By clicking “Add survey”, you can create a new survey. A new field appears where the survey name must be defined. Save the action with “Add”.

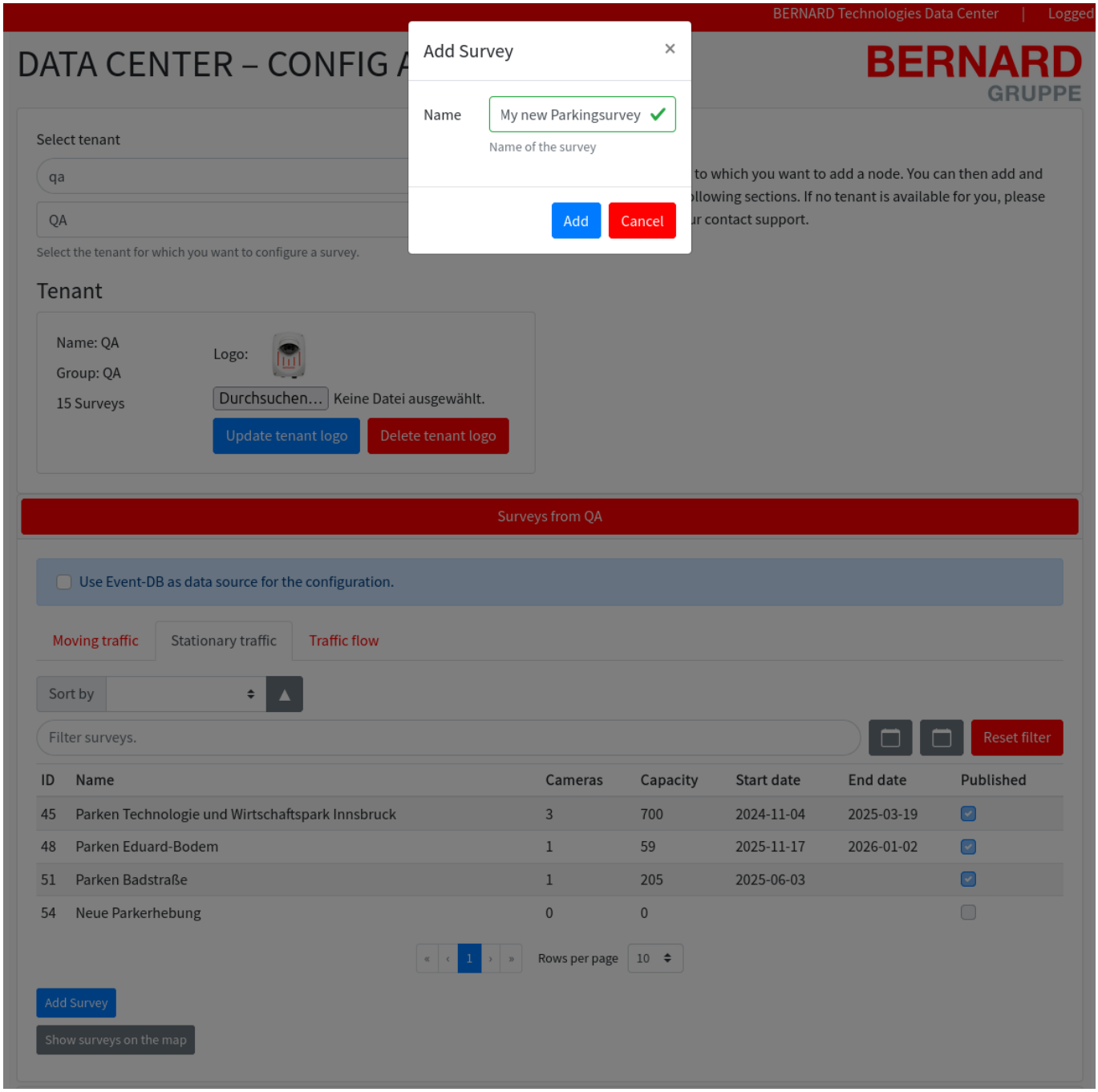


Figure: Adding a new survey

To edit a survey, click the corresponding entry. A configuration panel opens below the list. Click “Edit” to configure the selected survey.

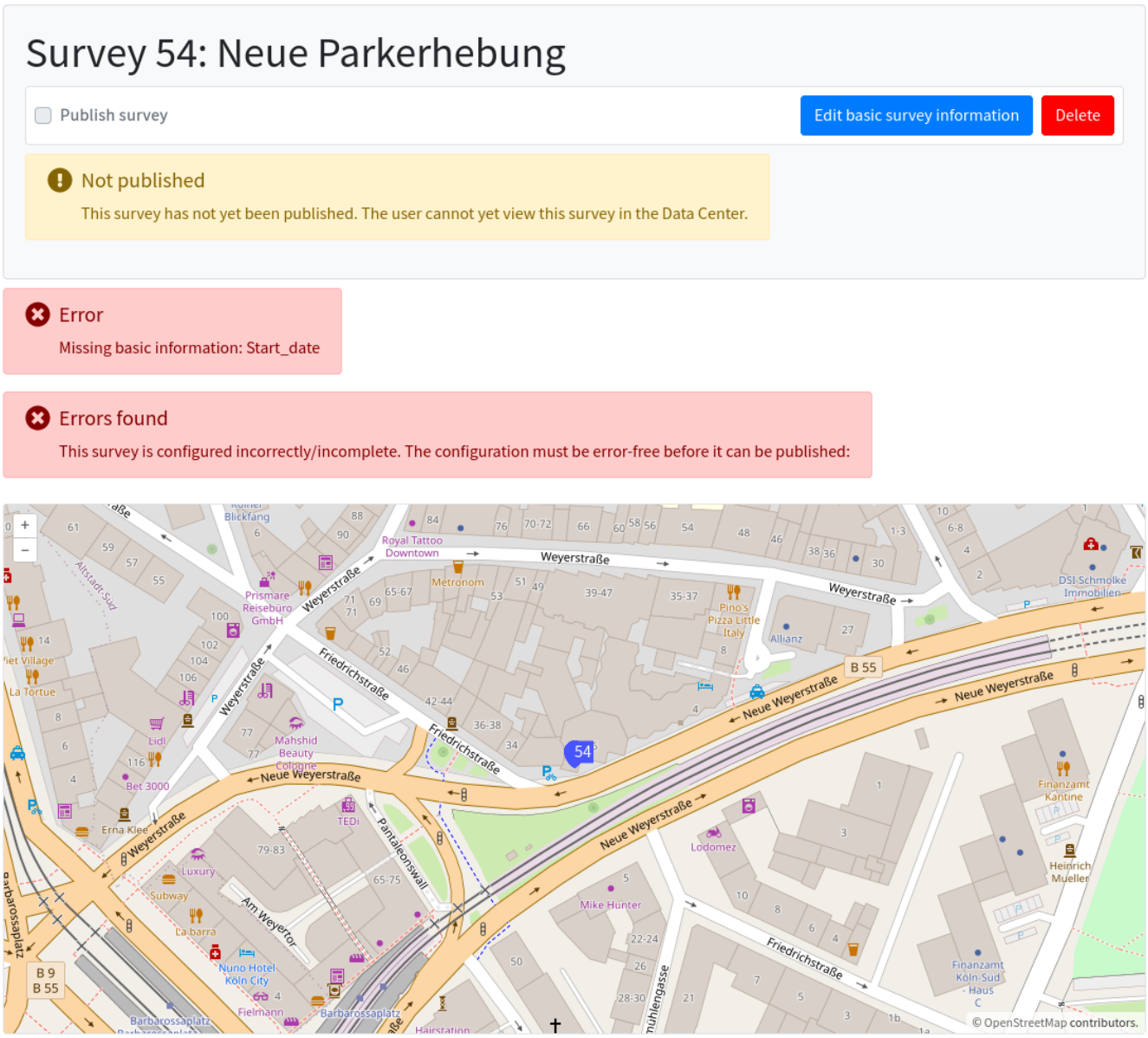


Figure: Editing interface for a selected survey in the Data Center

Defining Survey Parameters (Location, Date, and Class Selection)

A window opens with the key parameters: name, start date, end date, survey location, time zone, and vehicle classes. These parameters can be defined step by step. Table 1 describes the fields.

Edit survey: 54 - Neue Parkerhebung ×

Configuration of the survey

Name: Neue Parkerhebung

Name of the survey.

Alias: Enter alias.

Note!
If no alias is assigned, the data cannot be retrieved via the API.

The alias of the survey via which the data can be called up in the API.

Start date: TT . MM . JJJJ

Enter the start date of the survey. Value:

End date: TT . MM . JJJJ

Enter the end date of the survey. Value: Now

Location of the survey: ☐ Activate map for editing.



Place the center of the map on the geographical point of the survey.

Time zone: Europe/Vienna

Local time zone of the survey.

Info.
Based on the coordinates, we have determined that the time zone should be Europe/Berlin . We recommend that you change the time zone.

Change now

Traffic types:
- Car
- Car with trailer
- Motorbicycle
- Van

Configure the analysed vehicle classes for the survey.

Automatic calibration: ☐ Activate automatic calibration.

Activate the option to enable automatic calibration of the survey. The cron entry defines the times when calibration is performed.

Save Cancel

Figure: Configuration view for defining survey parameters

Table 1: Definition of survey parameters in the Data Center

Element	Description
Name	Describes the survey name you assigned when creating the survey. The name can be edited if required. **Note:** As surveys can be filtered by name, it is recommended to choose a unique name.
Date	The start and end dates define the evaluation period. The time is set to 00:00 by default; the end date includes the selected day. **Example:** A measurement on 01.01.2023 from 00:00 to 23:59 would have the start and end date set to 01.01.2023. The start date is mandatory, the end date optional.
Survey Location	To change the location on the map, enable “Activate map editing”. Use the magnifying glass to open a search field. The location is set by placing the marker on the interactive map via left-click. You can disable editing afterward.
Time Zone	The default time zone is “Europe/Vienna”. It is recommended to select the local time zone.
Vehicle Classes	These are the vehicle classes included in the evaluation. Select multiple classes with the Ctrl key. The selection can be adjusted later. If a required vehicle class is missing, please contact customer support.
Automatic Calibration	Automatic calibration allows you to set recurring calibration points for the group occupancy. Enable the feature and define the time using cron notation. Six fields are provided: the first defines the recurrence interval (year/month/day/week/hour/minute). The remaining fields specify the exact time. If needed, customer support can assist.

After defining the parameters, save the configuration using the save button in the bottom-right corner.

Adding and Editing Cameras

Next, assign the BMAs used in the survey. Open the selection window by clicking “Add/Edit Cameras”.

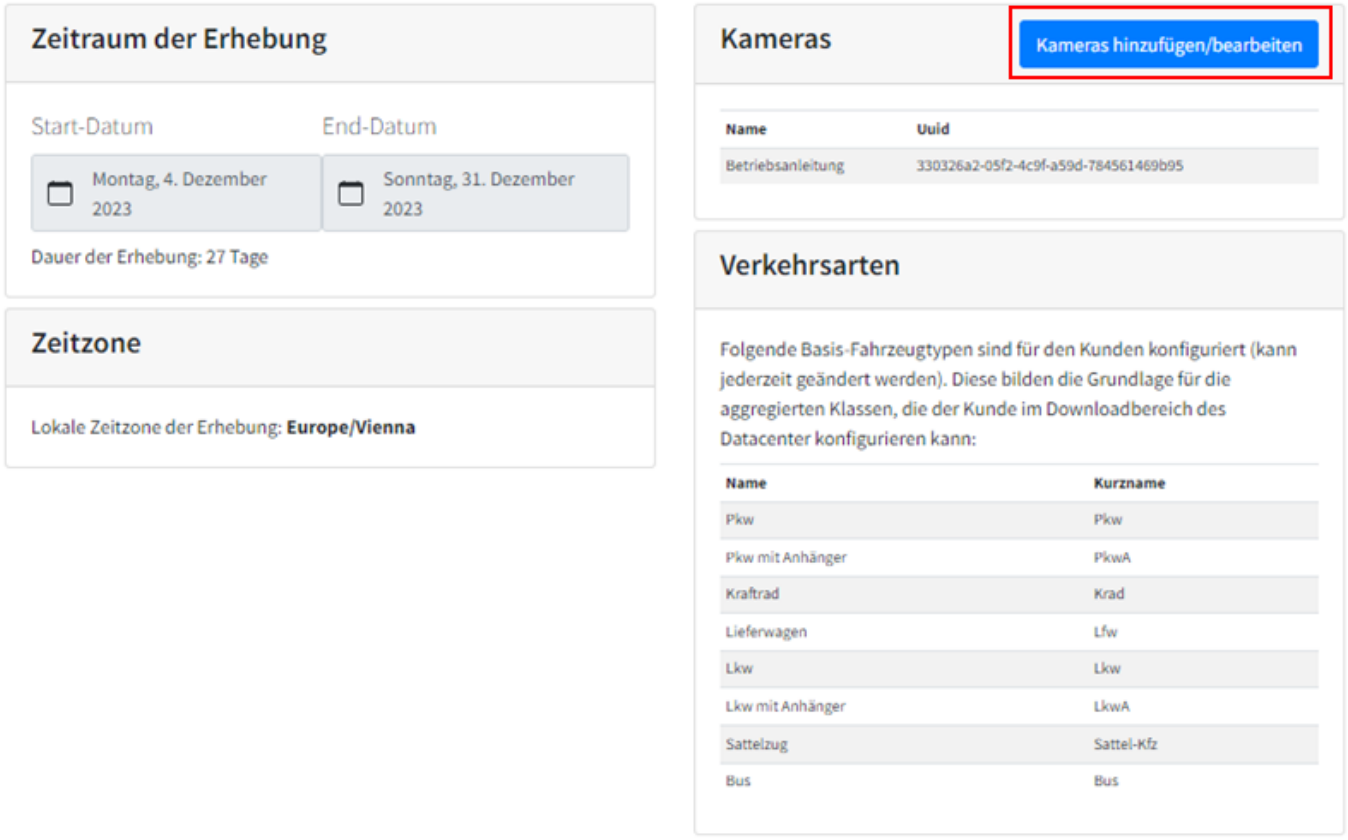


Figure: Adding a camera in the configuration interface

Add all BMAs that are used or were used for this survey. If you operate multiple BMAs, you can filter by device name to simplify selection.

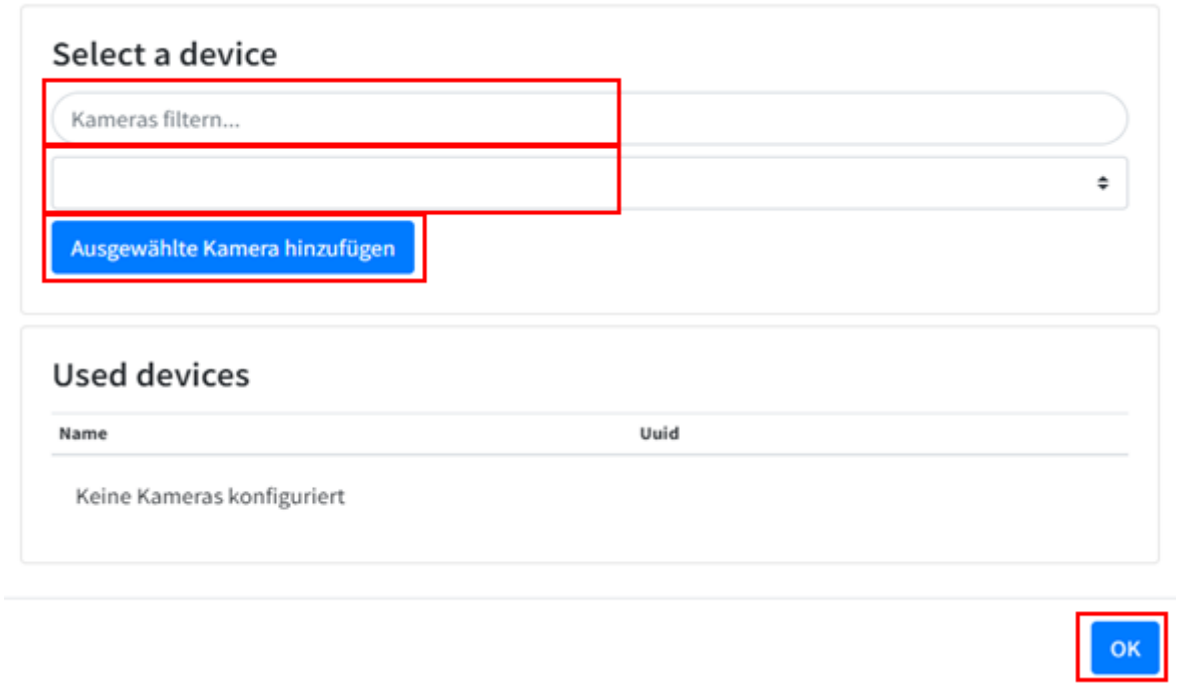


Figure: Selection window for assigning BMAs

After selecting a BMA, click “Add selected camera”. It will then appear in the “Used devices” table. If no more cameras need to be added, confirm with **OK**.

Parking Area Configuration

The surveyed parking area is divided into groups. At least one group must be created for proper configuration. Groups can be defined using two survey patterns:

- Entry/exit balancing
- Single-space detection (analysis of each space state)

Each group must have a unique name.

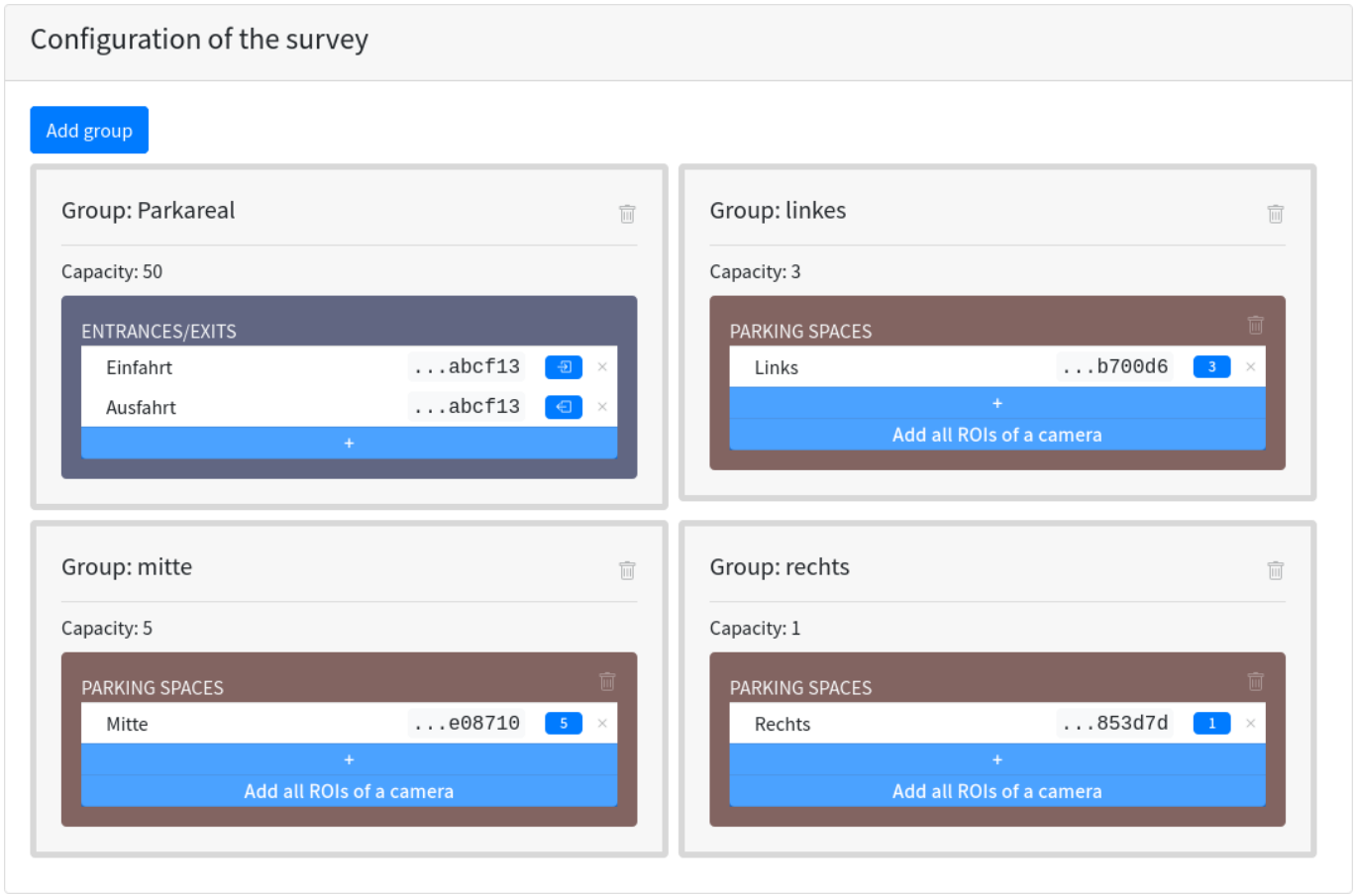


Figure: Configuration area showing created parking groups

Creating Groups

Click “Add group” to create a group. A group box appears. Clicking the group opens a dialog on the left, where you can assign a name and capacity. Click “Save” to confirm.

Configuring Survey Patterns for a Group

The following sections describe the two survey patterns:

- Entry/exit balancing
- Single-space detection

Entry/exit balancing

To configure entry/exit balancing, click the “+” button in the **ENTRY/EXIT** section. This option is only available if no parking spaces have been added.

A dialog opens where you can define the entry/exit. Select a name and type:

- Entry
- Exit

Select the UUID of the Crossing Line used for detecting vehicles. The configured travel direction (“crossingline mapping”) is essential here.

Save the configuration with “Save”.

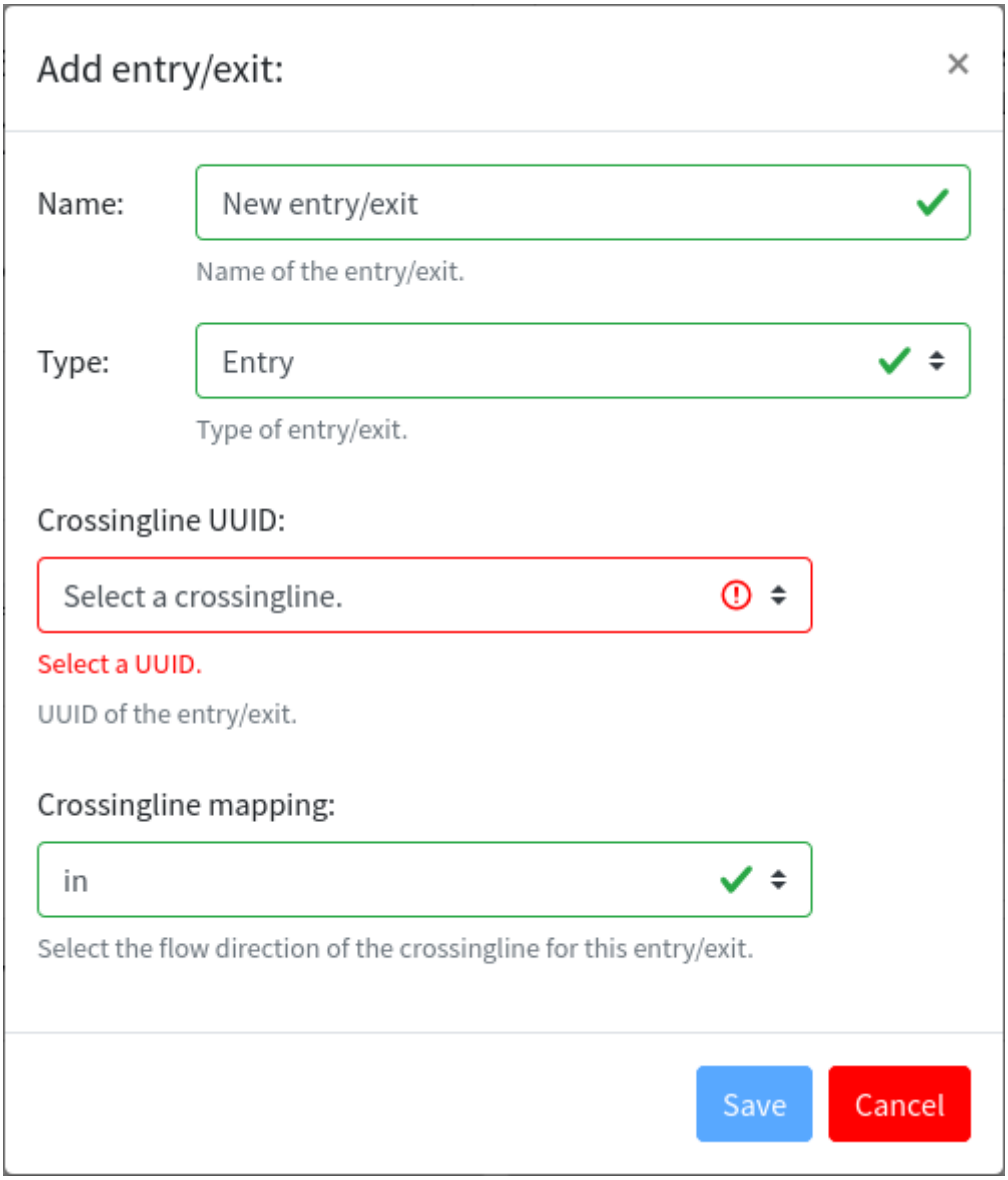


Figure: Adding an entry/exit

Additional Notes

- The same Crossing Line can be used for entry and exit if different directions are configured.
- The group capacity must be set manually.
- Groups with entry/exit configuration require at least one calibration point (occupancy at a point in time).
- A default calibration point with value 0 is created automatically 7 days before the survey start date.
- Additional calibration points can be added in the Data App.

Single-space detection

To configure parking spaces, click the “+” button in the **PARKING SPACES** section. This option is only available if no entry/exit points have been added.

A dialog opens where you can select the parking space. Only spaces that are not yet used are displayed. If the name and capacity are stored in the Control Center, they are applied automatically.

Save the configuration with “Save”.

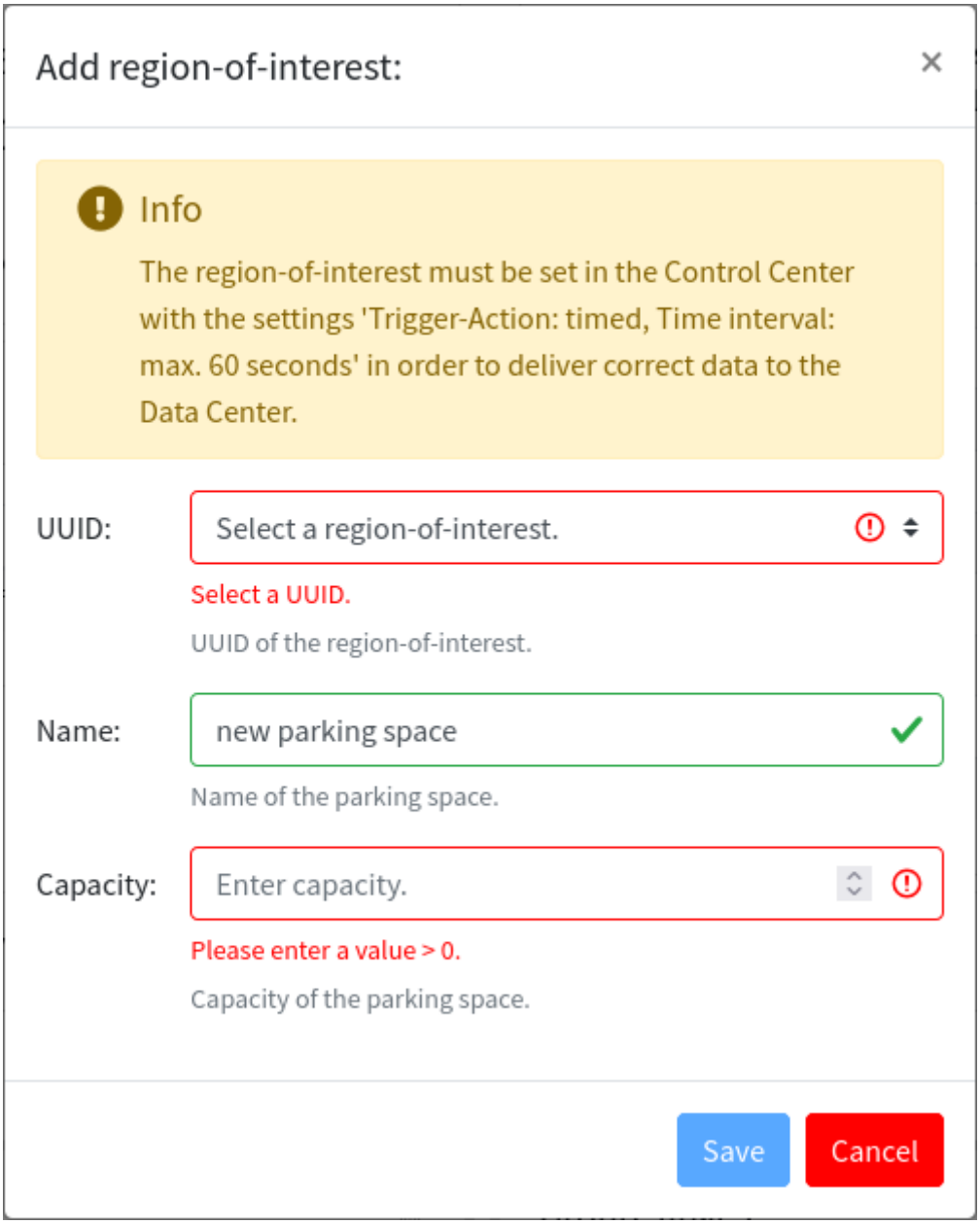


Figure: Adding a parking space

Additional Notes

- You can add all spaces of a camera via “Add all ROIs of a camera”.
- The group capacity is calculated automatically based on all assigned parking spaces.

Configuration Validation

The configuration is checked automatically. Red notification boxes indicate any remaining issues.

If everything is correct, a notice appears at the top of the configuration page and you can publish the survey.

You can now view the survey data in the Data Center. More information is available in the Data analysis.

Data Analysis

This document describes the data analysis of **parking surveys** in the Data Center. Once a survey has been created and published, it can be viewed in the Data App.

1. Purpose of the Dashboard

The dashboard is used for the **visualization, monitoring, and analysis of parking occupancy** based on BMA sensors.

With the dashboard, you can:

- monitor the current occupancy of a parking area
- analyze historical occupancy data
- review entries and exits
- investigate different sub-areas of a parking space separately

2. Header Section – Survey & Location

In the upper-left area, the **survey metadata** is displayed.

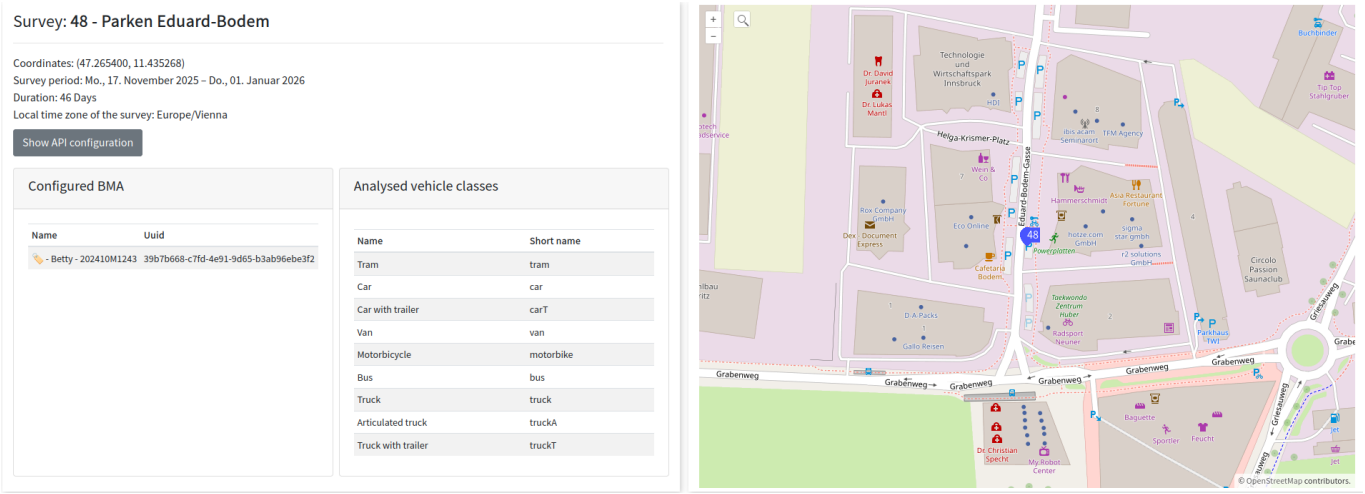


Figure 1: Metadata of a parking survey in the Data Center

2.1 Survey Information

Displayed information includes:

- **Name of the survey**
  - e.g. `Survey 48 – Parking Eduard-Bodem`
- **Coordinates** of the measurement location
- **Survey period**
  - e.g. “Survey period: 10 November 2025 – 01 January 2026”
- **Duration of the survey**
- **Local time zone**
  - e.g. “Local time zone of the survey: Europe/Vienna”

Optionally, there is a button:

- **“Show API configuration”**
  - opens detailed configuration data (relevant only in the context of the API).

2.2 Configured BMA Units

Under “Configured BMA”, one row is shown per sensor:

- **Name** (e.g. `BMA20250412-name`)
- **UUID** of the device

Each BMA represents a measurement point from which entries/exits and occupancy data are collected.

2.3 Analyzed Vehicle Classes

Next to it, the **detected vehicle types** are listed, e.g.:

Class Name	Short Name
Tram	`tram`
Car	`car`
Car with trailer	`carT`
Truck	`truck`
Bus	`bus`
Bus with trailer	`busT`
Truck with trailer	`truckT`

This list is informational and indicates which classes can be considered in analyses.

2.4 Map View

In the upper-right corner, there is an **interactive map** showing the survey location.

3. Toolbar & Time Period Control

In the middle-left area, the **toolbar** is located.

Toolbar

Period

Friday, November 28, 2025

November 2025

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6

Use cursor keys to navigate calendar dates

Interval

- ○ every minute (max. 1 day)
- ◉ every 15 minutes (max. 7 days)

Displayed groups

Affects the historical evaluation of occupancy.

- ☑ Parkareal (CL)
- ☑ linkes
- ☑ mitte
- ☑ rechts

60

Calibrate groups with crossing lines

Figure 2: Toolbar for controlling data analysis

3.1 Select Time Period

Using a calendar, the **analysis time period** can be selected:

- single days
- multi-day intervals over up to 7 days

The selected time period is shown in the diagram title, e.g.:

“Analysis for the period: 28 Nov 2025, 00:00 – 4 Dec 2025, 00:00”

3.2 Temporal Resolution

Aggregation options:

- **“every minute (max. 1 day)”**
  - high temporal resolution for detailed analysis of a single day
- **“every 15 minutes (max. 7 days)”**
  - reduces data volume, suitable for longer periods

This setting applies to all diagrams in the analysis section.

3.3 Displayed Groups

Under “Displayed Groups”, you can filter which sub-areas appear in the diagrams.

4. Current Occupancy of the Parking Area

The section “Current occupancy of the parking area” shows **live values**.

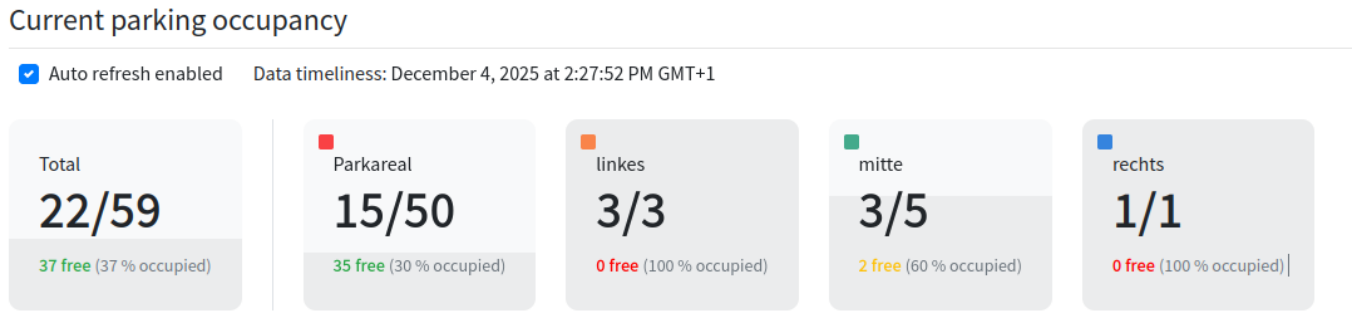


Figure 3: Live data of a parking survey in the Data Center

4.1 Auto-Refresh

- **Auto-refresh** can be enabled or disabled.
- When enabled, the occupancy tiles refresh automatically at a fixed interval.
- The last update timestamp is shown, e.g.:
  - “Updated on: 4 December 2025 at 11:29:30 CET”.

4.2 Occupancy Tiles

Several tiles are displayed:

- **Total**: `X/Y` occupied spaces (e.g. `14/59`)
- **other parking groups**: `X/Y` (e.g. `10/50`)

Below each tile:

- **free spaces and percentage occupancy** (e.g. “45 free (24% occupied)”)
- **color coding** for load levels:
  - green: low occupancy
  - orange: medium occupancy
  - red: high / critical occupancy

This view provides a **quick assessment of the current parking situation**.

5. Historical Analysis – Occupancy

In the lower section, the **occupancy diagram** is shown.

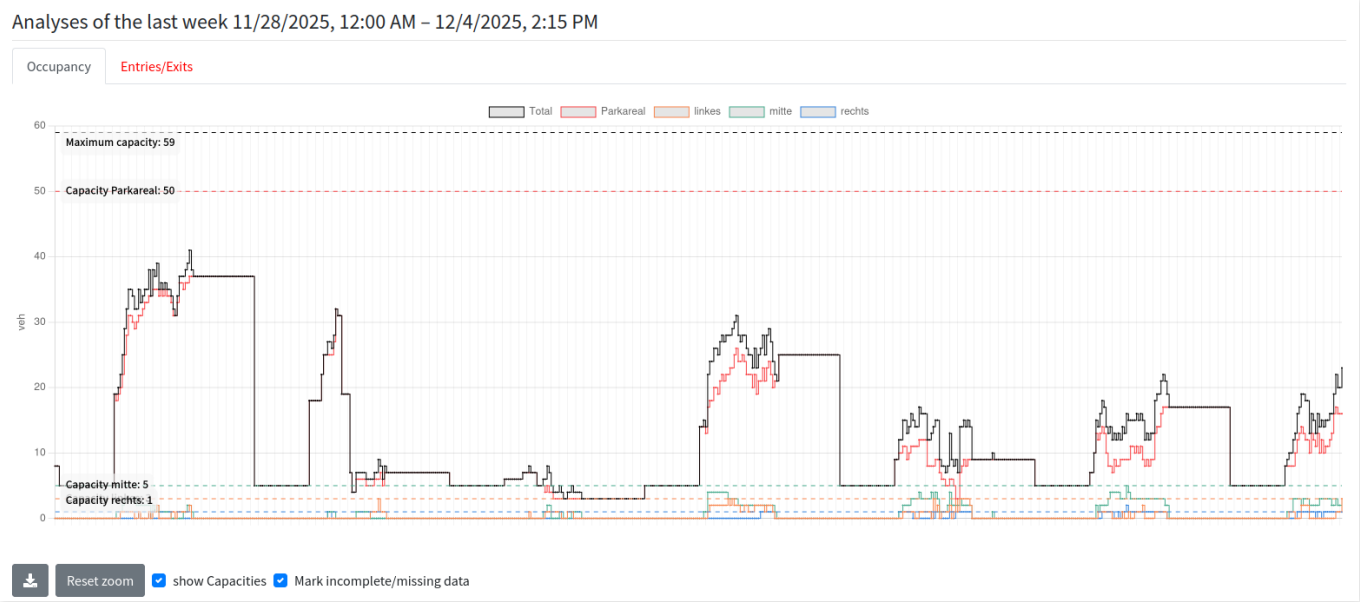


Figure 4: Historical occupancy analysis of a parking survey in the Data Center

5.1 Diagram Type

- Line chart with time axis (x-axis) and number of occupied spaces (y-axis).
- Multiple lines for:
  - total occupancy
  - all other configured groups

5.2 Contents

- **Maximum capacity** per group (horizontal lines)
- **Occupancy trend** over the selected period
- **Legend** above the diagram with color-to-group associations

This diagram answers questions such as:

- When was the parking area at maximum capacity?
- How does occupancy differ between groups?
- How does occupancy evolve over the course of a day or week?

6. Historical Analysis – Entries and Exits

By switching between “Occupancy / Entries & Exits”, the **traffic flow diagram** can be displayed. This is only available if groups were configured using entry and exit points.

To view the analysis of a group, select the group in the drop-down menu below the diagram.

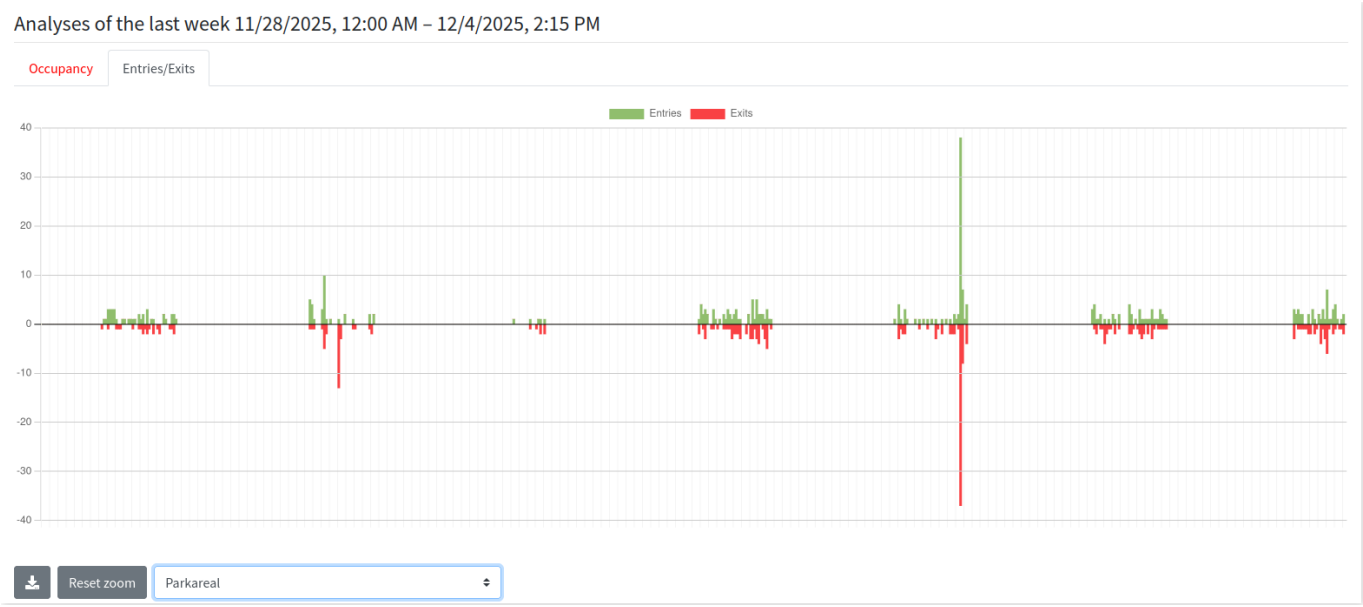


Figure 5: Historical analysis of entries and exits of a parking survey in the Data Center

6.1 Diagram Type

- Bar chart with time axis (x-axis)
- **Positive values**: entries
- **Negative values**: exits
- Color scheme, e.g.:
  - green: entries
  - red: exits

6.2 Interpretation

- Identification of **peak periods** (e.g. morning inflow, evening outflow)
- Comparison of different days within the same time period
- Analysis of effects caused by events or changes in traffic guidance

7. Interaction Options Below the Diagrams

The following functions are available below the diagrams:

7.1 “Reset Zoom”

- Resets all zoom and pan actions in the diagram to the **default view**.
- Useful when the user has zoomed into detailed areas.

7.2 “Show Capacities”

- Toggles **capacity lines** for the selected groups.
- Provides a clear view of when the maximum number of parking spaces is reached.

7.3 “Mark Incomplete/Missing Data”

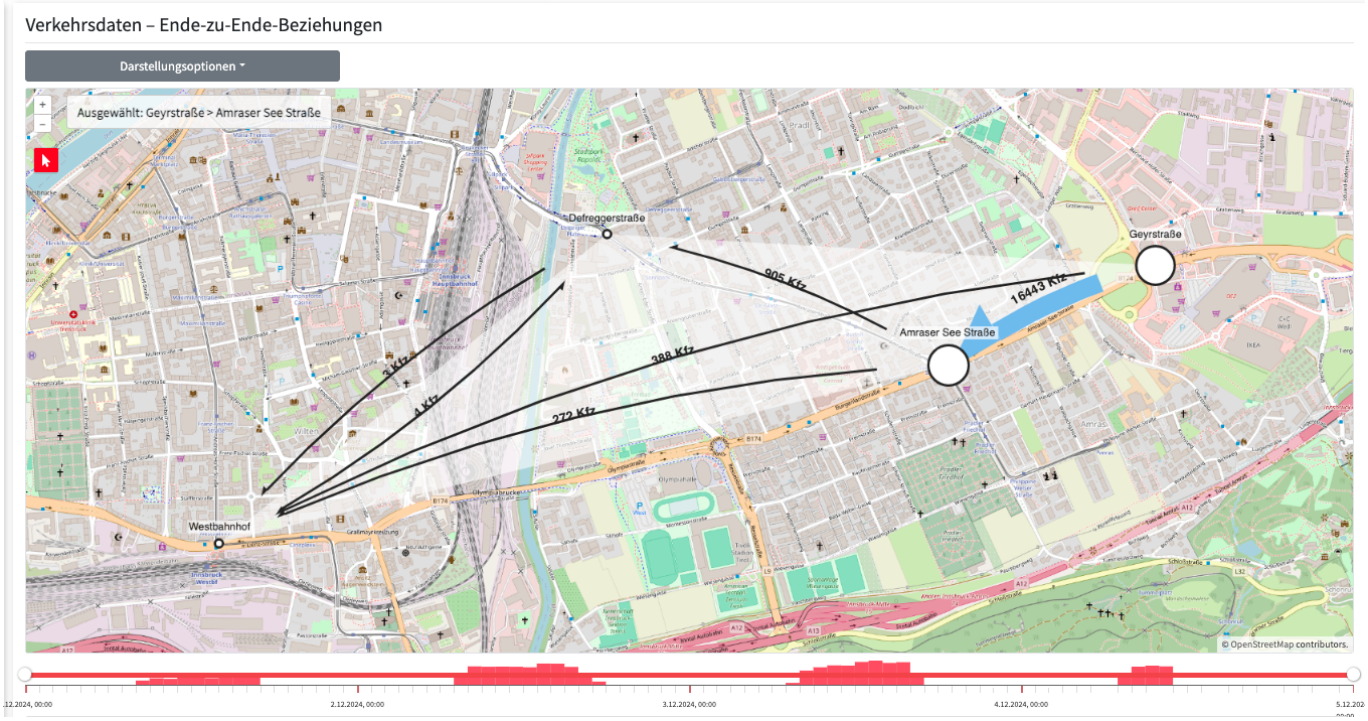
- Highlights areas with **data gaps or sensor errors**.
- Helps assess data quality (e.g. during sensor outages).

8. Known Limitations

- Groups that use entry and exit points require a calibration point at the beginning of the measurement so that balancing has an initial reference value.
- For data analysis of groups using entry and exit points, a calibration point must exist **within 7 days before the query time for parking data**. Otherwise, balancing cannot be performed.

Traffic Flow

A traffic flow survey is used to survey traffic flows within a closed area, also known as a cordon. The basis for this are cross-sectional counts where vehicles with license plates are recognized by BCAs. The images and license plates are only processed on the device and linked to traffic flows using a hashing algorithm, fully GDPR compliant. Source, destination and transit traffic as well as traffic flows at selective nodes or relationships are available for data analysis. Traffic flows can be segmented by traffic classification, travel time and origin by country and region.



Example of a traffic flow survey.

Configuration of a Traffic Flow survey

Configuration of a Traffic Flow survey

After successful installation and configuration of the BCA, open the web browser and enter the following address:

https://datacenter.bernard-gruppe.com

You can log in to the website with your customer login. If you have problems logging in or have forgotten your password, Support Center can help you.

To create a survey, first open the highlighted "**Config App**" tab at the top right of the menu bar.

Selection of the Tenant

Next, select the desired tenant to continue with the configuration. The tenant can be used to group measurement
series. If you require more than one tenant, please contact customer service. Switch to the **“Traffic Flow”** tab.

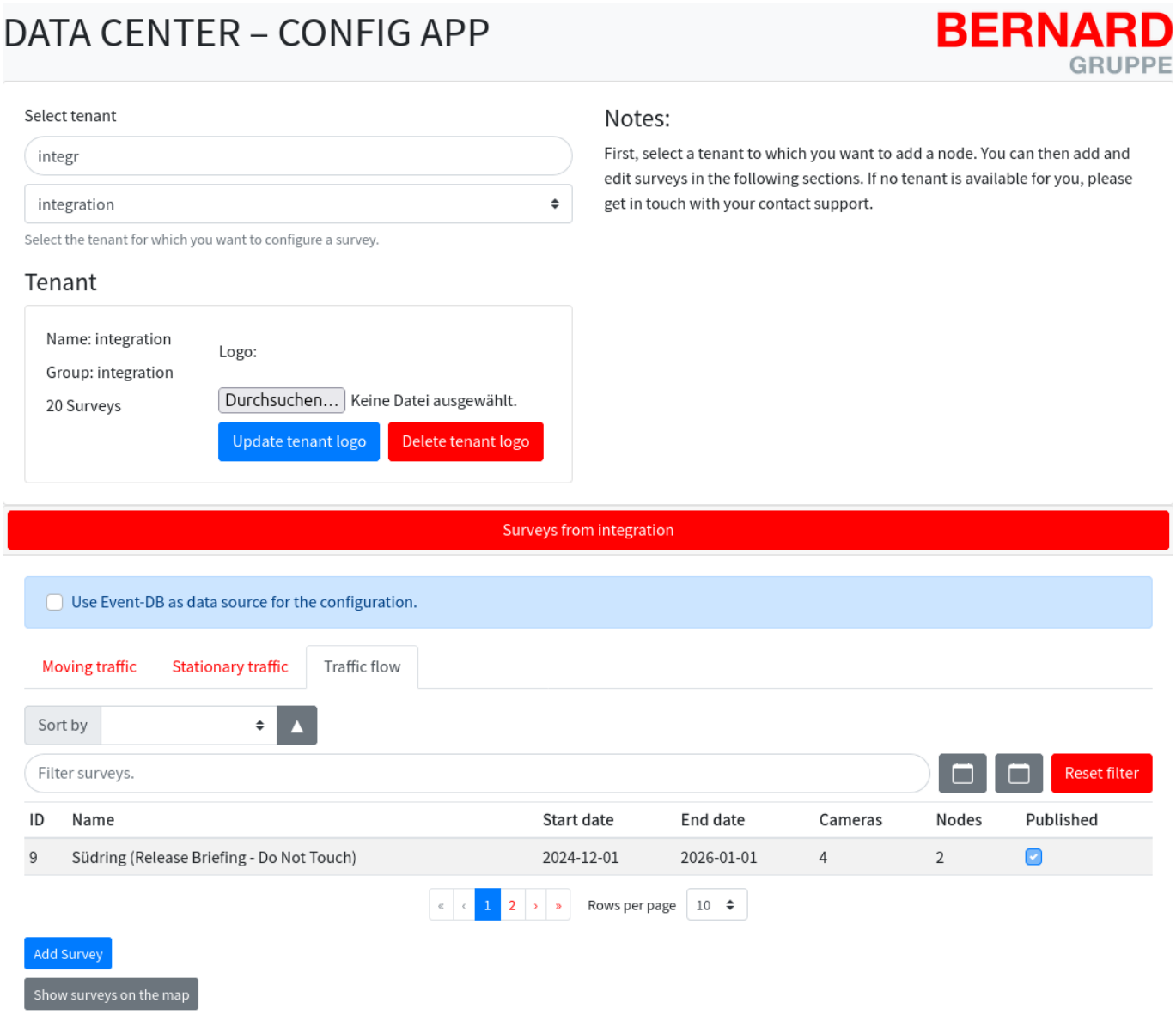


Figure 1: Tenant & Survey

Add Survey

You have the option of filtering your surveys by date or text content. It is therefore advisable to select the name of the survey so that it can be easily found later and, if necessary, different groupings are possible using the text filter (e.g. location/project number).

A new survey can be created using the **“Add survey”** button. A new field is created in which the name of the survey must be defined. Save by clicking "Add".

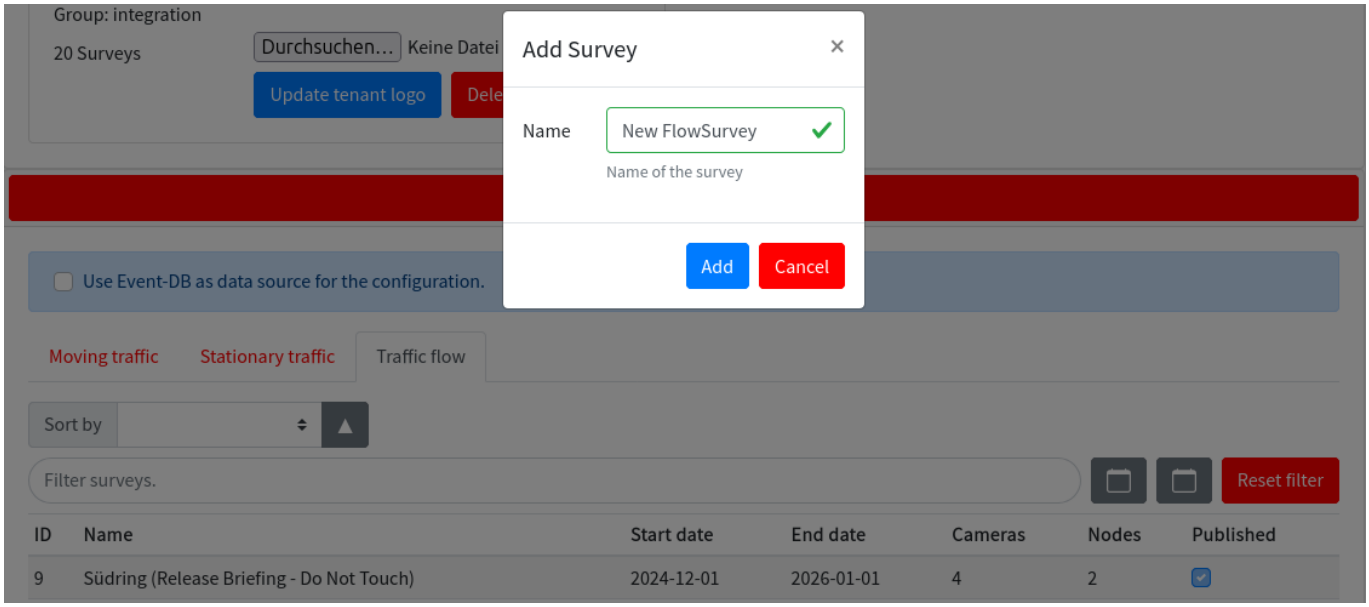


Figure 2: Adding a new survey.

To edit a created survey, select the relevant survey by clicking on it. A user interface then opens below the list of created surveys. The selected survey can be configured using the highlighted **“Edit”** button.

Definition of key data (date and traffic types)

A window opens with the key data - Name, Alias, Start date, End date, Time zone and Traffic types.

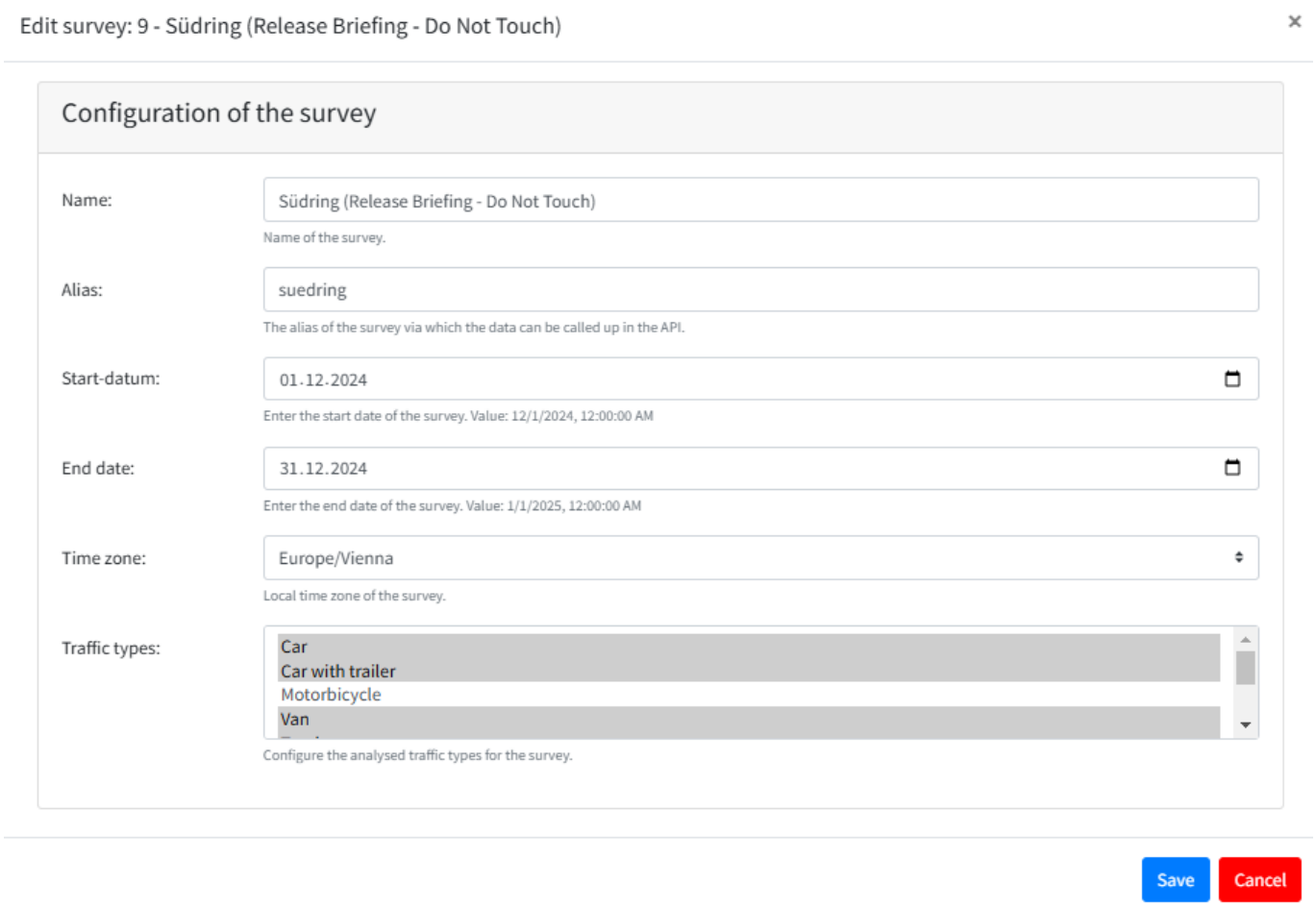


Figure 3: Configuration of a selected survey.

Table 1: Definition and key data of a survey

Field	Description
Name	Describes the name of the survey that you initially assigned when creating the survey. If required, the name of the survey can be edited in the corresponding field.  Note! As it is possible to filter the surveys by name, it is recommended to select a unique name.
Date	The start and end date define the period for the data evaluation. For the start and end date, 00:00 is automatically selected as the time, with the end date including the selected day. Example: For a survey on the 01.01.2023 from 0:00 to 23:59, the start date and end date are both 01.01.2023.

Field	Description
Alias	Describes a unique name with which the results of the survey can be retrieved via the API. The alias of the survey can be edited in the corresponding field. Note: Only alphanumeric characters (a-z, A-Z, 0-9) are valid here.
Time Zone	The time zone is set to the “Europe/Vienna” region by default. It is recommended to select the local time zone of the survey in the menu.
Traffic types	The traffic types are the vehicle classes that are to be included in the evaluation for this survey. By pressing the Ctrl key, several traffic types can also be selected for a single survey. In order to make the application possibilities of the evaluation more flexible, the selection of the survey can also be adjusted retrospectively. Note: Only traffic types with license plates are listed.

After successfully configuring the key data of the survey, save this process by clicking the save button.

Add/edit cameras

The next step is to assign the BCAs used to the survey. To do this, open the selection window by clicking on “Add/edit cameras” (see Figure 4). Add all the BCAs that you are using or have used for this survey.

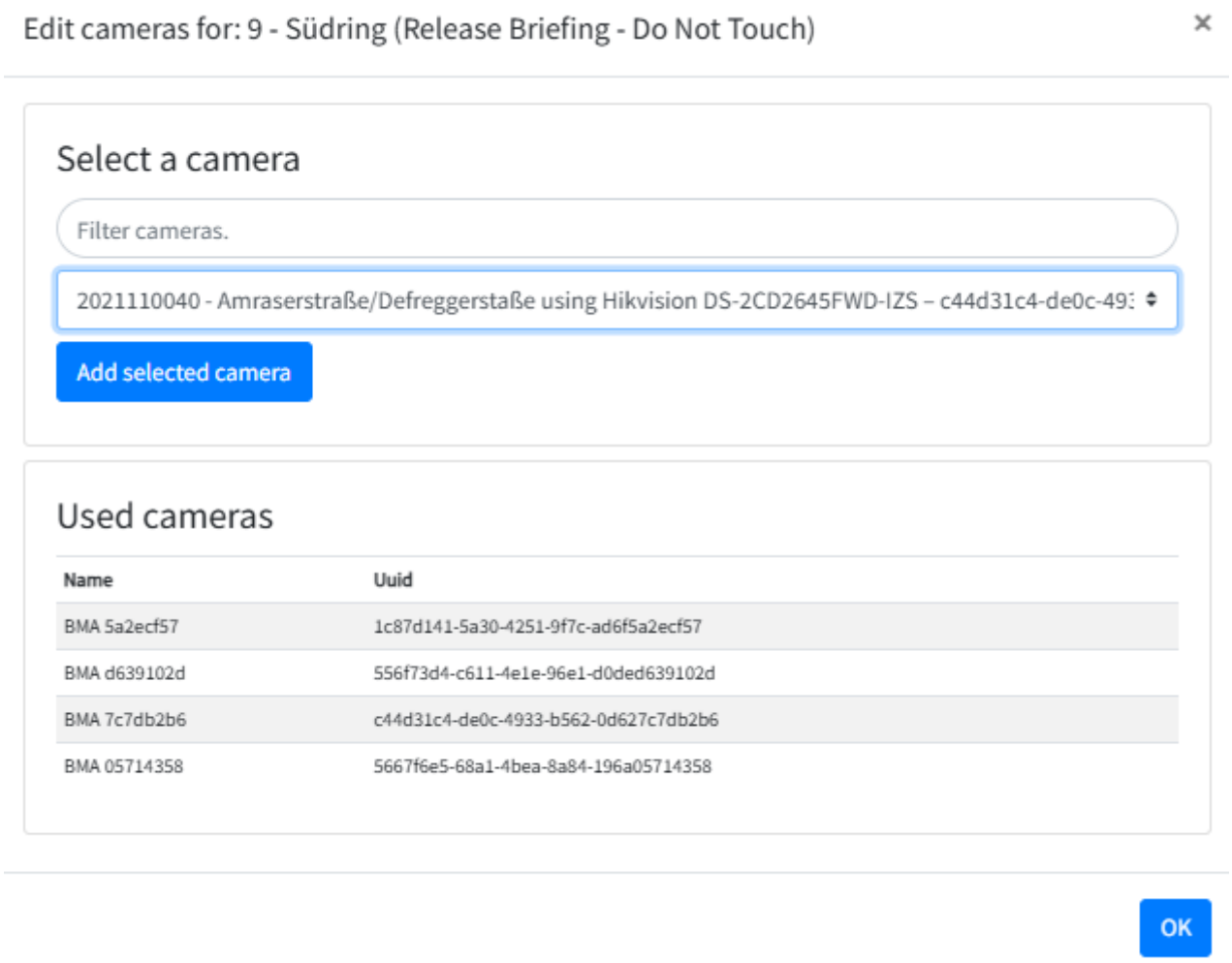


Figure 4: Add/edit cameras

Once you have selected your BCA, click on “Add selected camera” and it will appear in the “Cameras” table (see Figure 5).

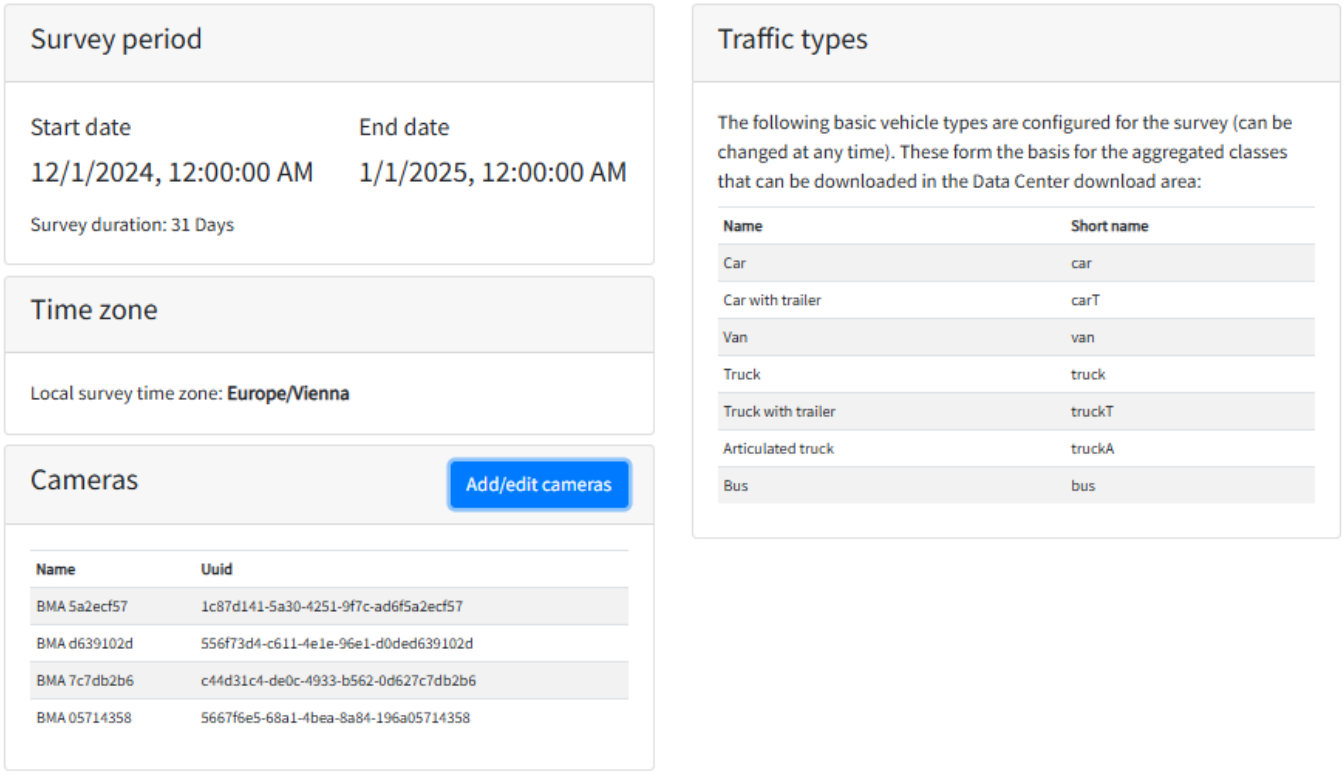


Figure 5: Overview of the survey

Configuration of a cordon

Node

A traffic flow survey should consist of at least 2 nodes. Open the “Survey layout” section and navigate to the correct position on the map. Now add a new node using the pen tool.

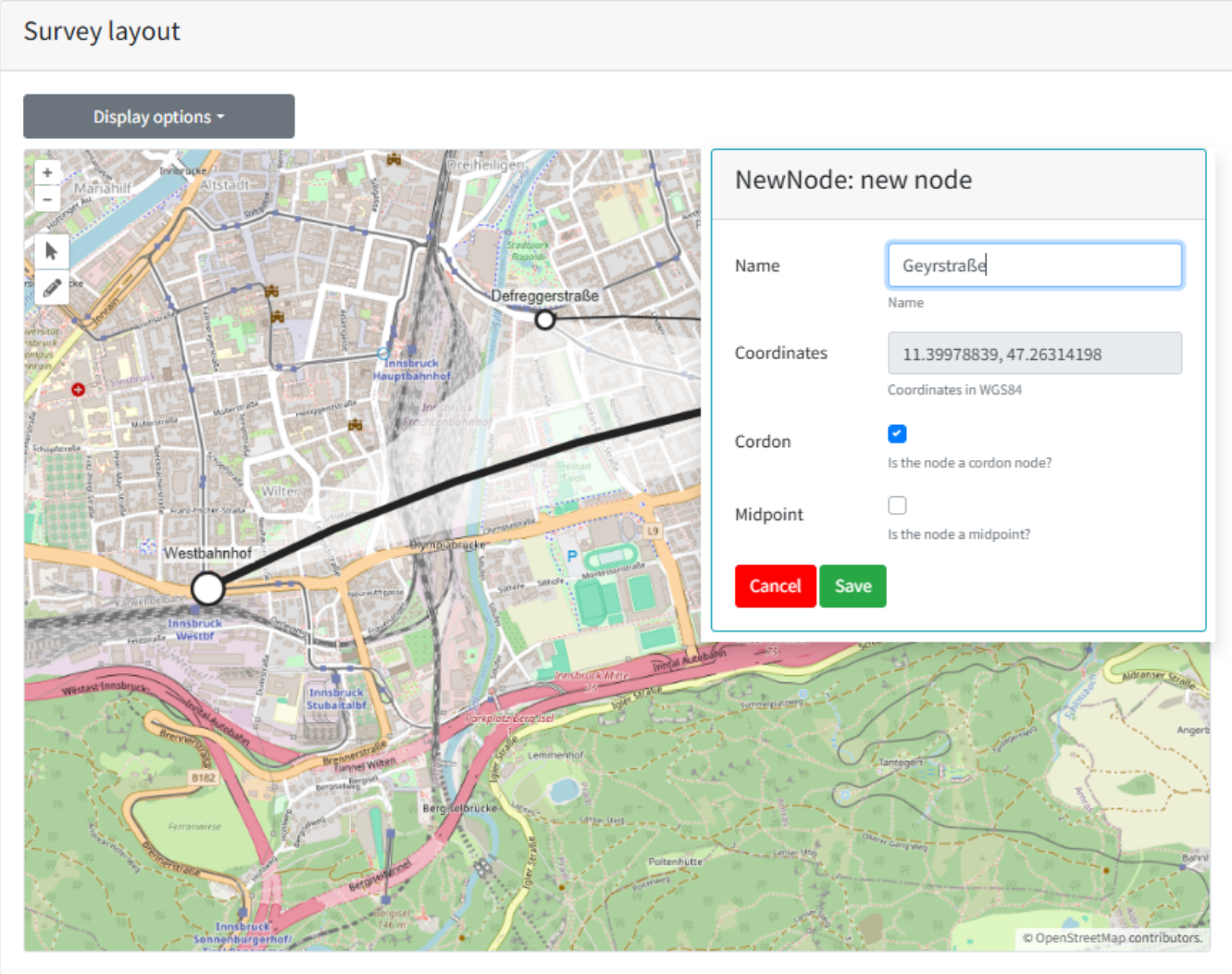


Figure 6: New node

Table 2: Node types

Node types	
Cordon	Node for incoming and outgoing traffic in a cordon (closed area). Trips that are evaluated always start and end at a cordon. They are then evaluated as transit traffic. If a journey has only been detected at a start node, it is evaluated as destination traffic in the area.
Midpoint	Nodes within the cordon.

Node types

Trips that are classified as transit traffic can be broken down into sub-routes in more detail using center nodes.

The following figure shows an example traffic survey with a cordon and which node types should be configured where:

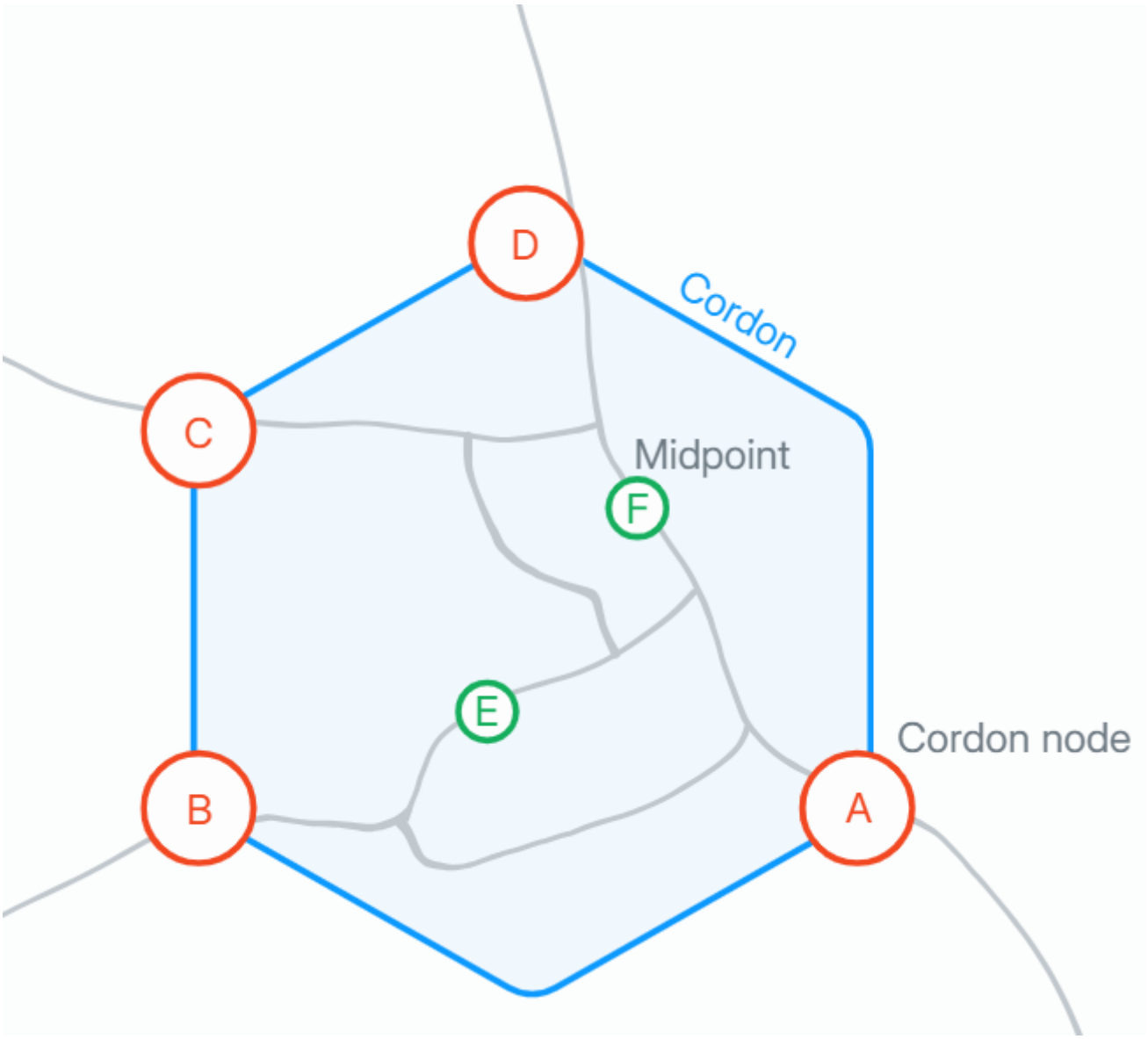


Figure 7: Example node types

Nodes A, B, C and D are cordon nodes. This is where the tracking of trips through the cordon, i.e. the area defined by the nodes, begins and ends.

Nodes E and F are midpoints and are used for a differentiated analysis of the sections over which the through trips have passed. For example, through traffic may have traveled from A to B on a direct route or via the midpoint E. This differentiation is possible using the “Show subjourneys” option in the evaluation.

Trigger

The node can be edited and triggers configured using the selection tool. Select the crossing line trigger of the corresponding device.

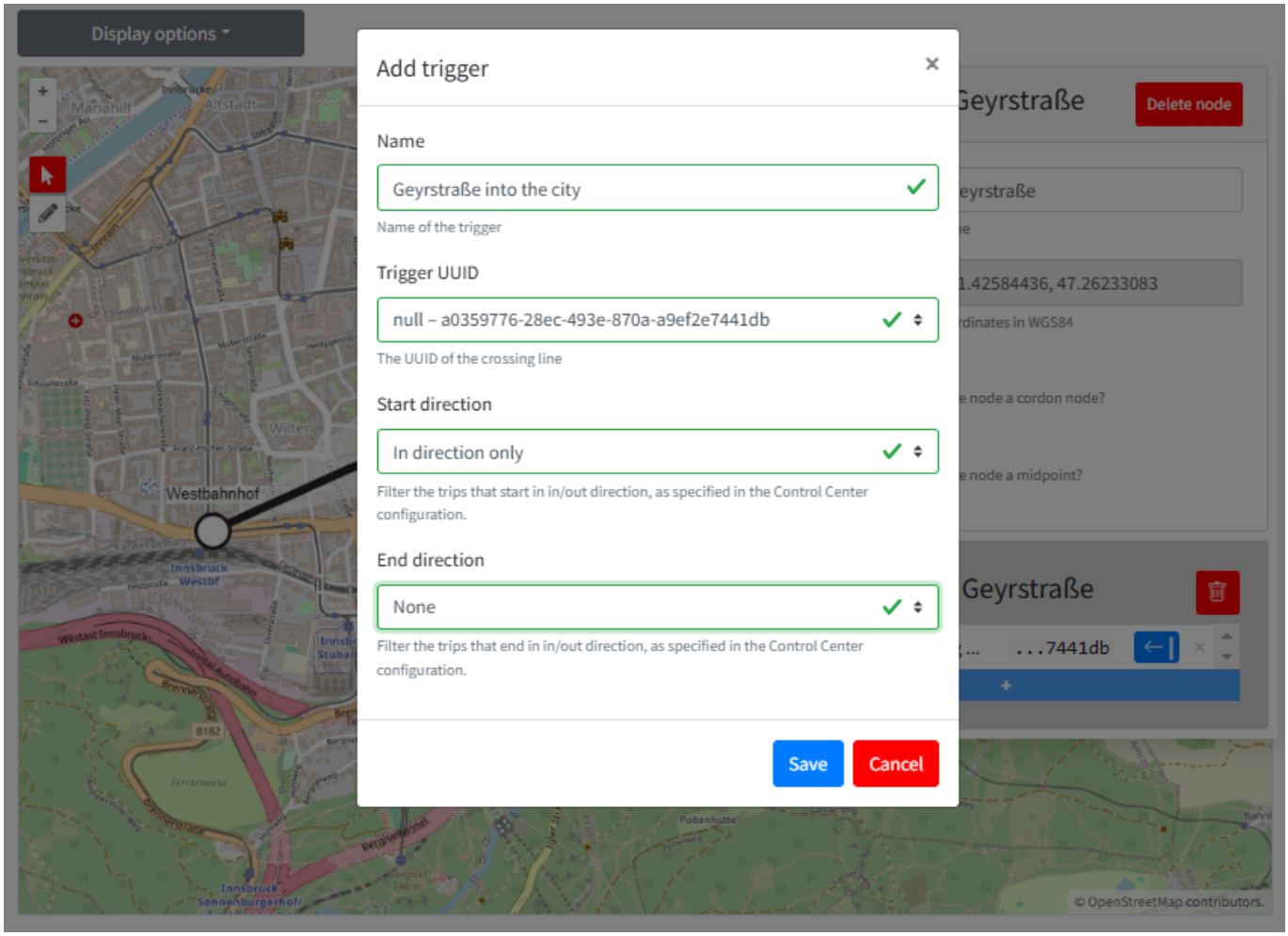


Figure 8: Trigger configuration

Table 3: Trigger parameters

Publish survey

If the configuration is error-free, the survey can be published. A published survey can now be viewed in the “Data App”.

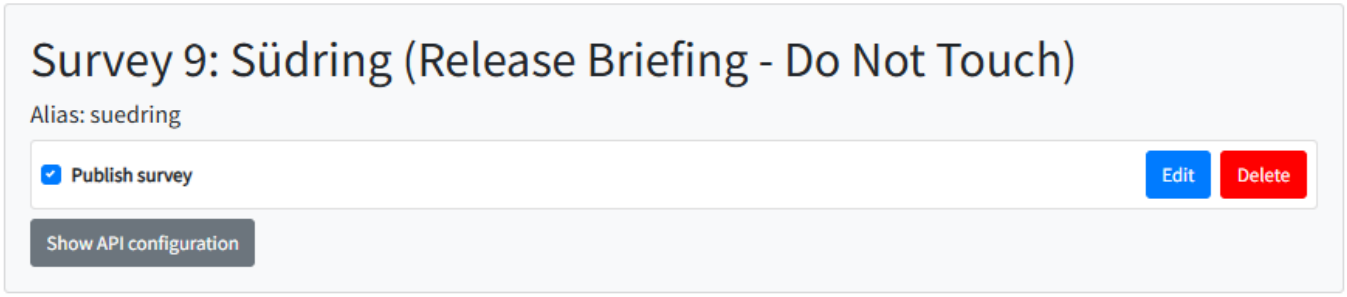


Figure 9: Publish survey

Data analysis

Once a survey has been created, the data can be analyzed. Select the corresponding tenant to which your survey has been assigned. To make it easier to find the survey you are looking for, you can filter the surveys by name, the survey period (start and end date) and the selected map section.

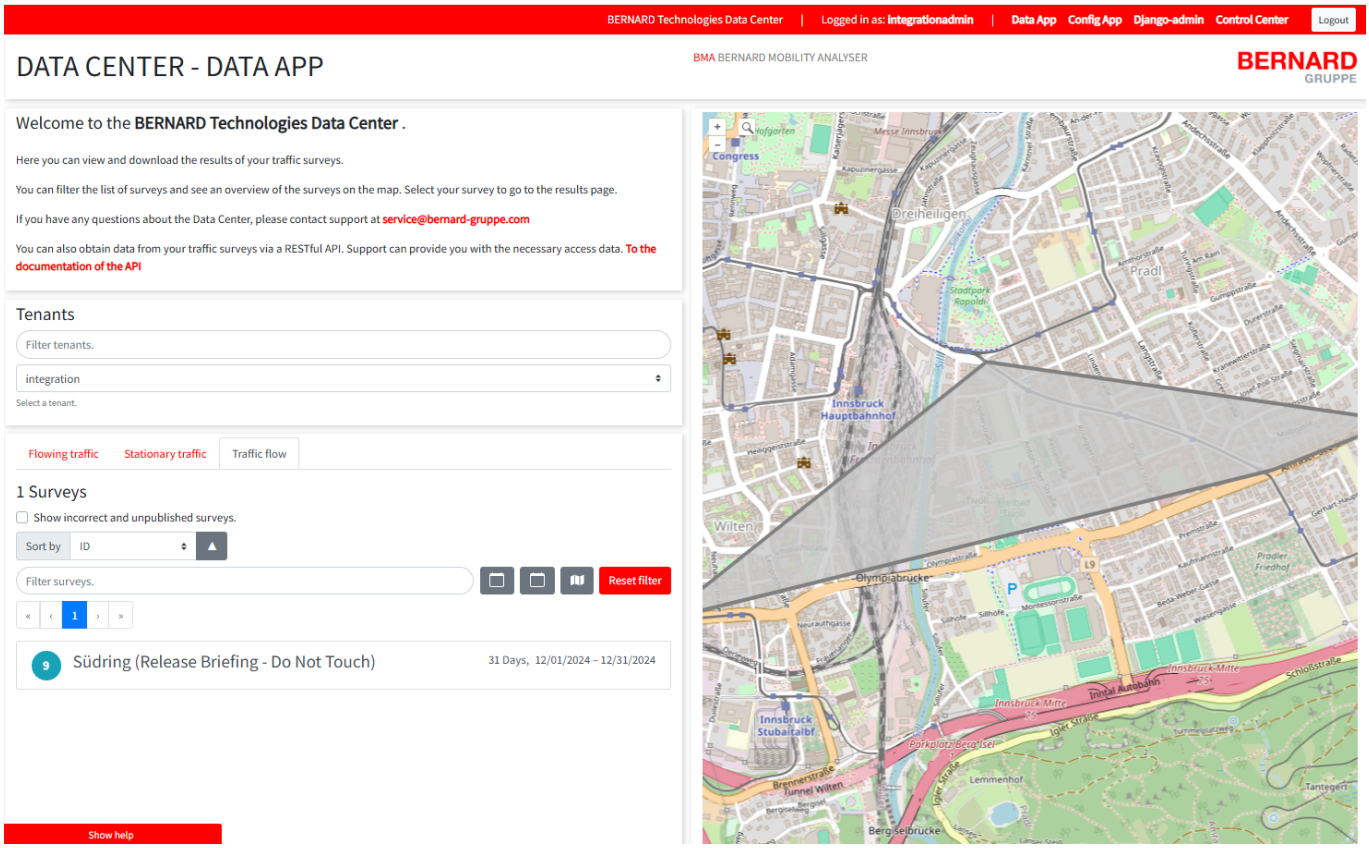


Figure 1: Overview of surveys

Overview of the survey

In the Data Center you will find an overview of the BCAs used, the traffic classes evaluated, the time period or time zone and the locations of the survey shown on the map.

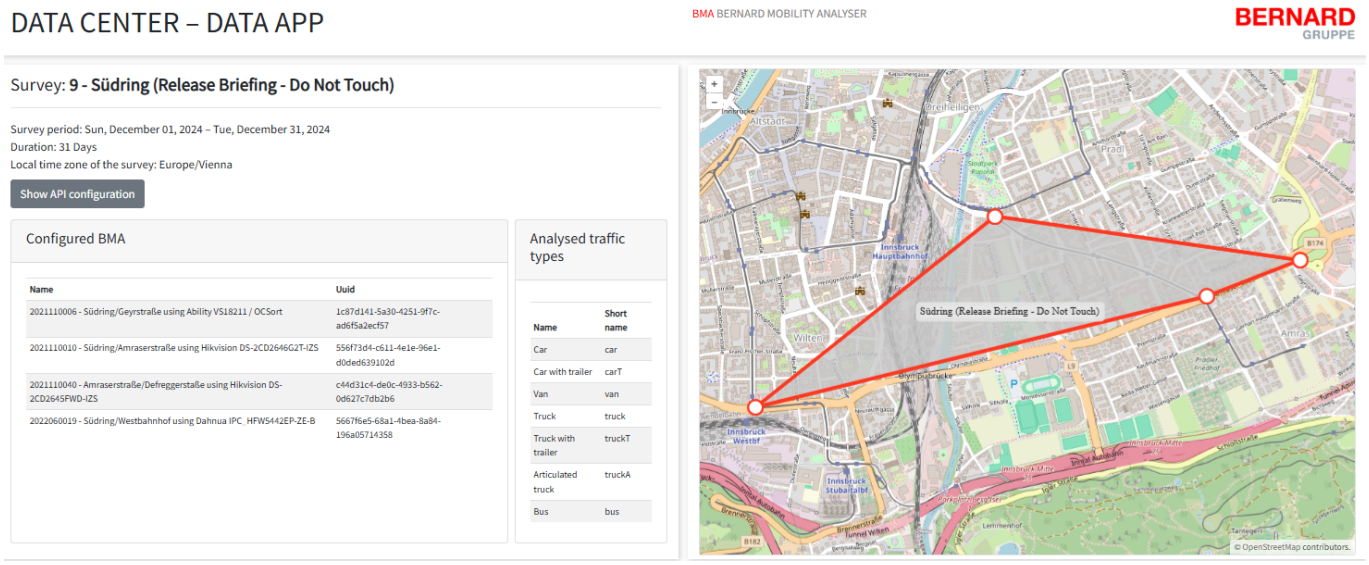


Figure 2: Overview of the survey

Traffic data

Nodes and relationships with flow data for the selected period are displayed. A maximum of 7 days is displayed. The period can be restricted using the slider below the display. The evaluated traffic classes can be restricted under “Displayed classes”.

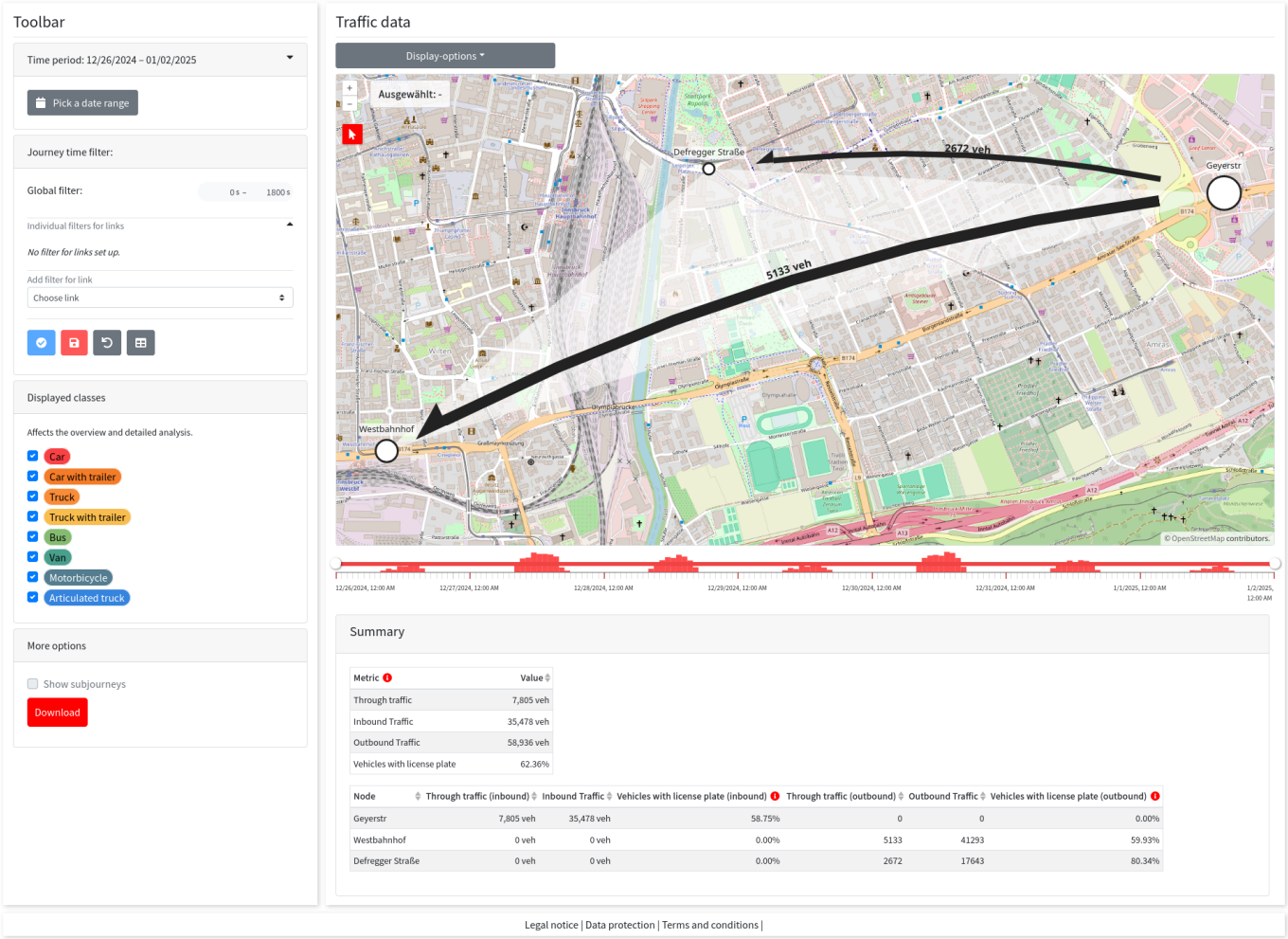


Figure 3: Traffic data

When selecting a relationship between two nodes, traffic distribution, travel time and the license plate countries or, depending on availability, the associated regions are broken down.

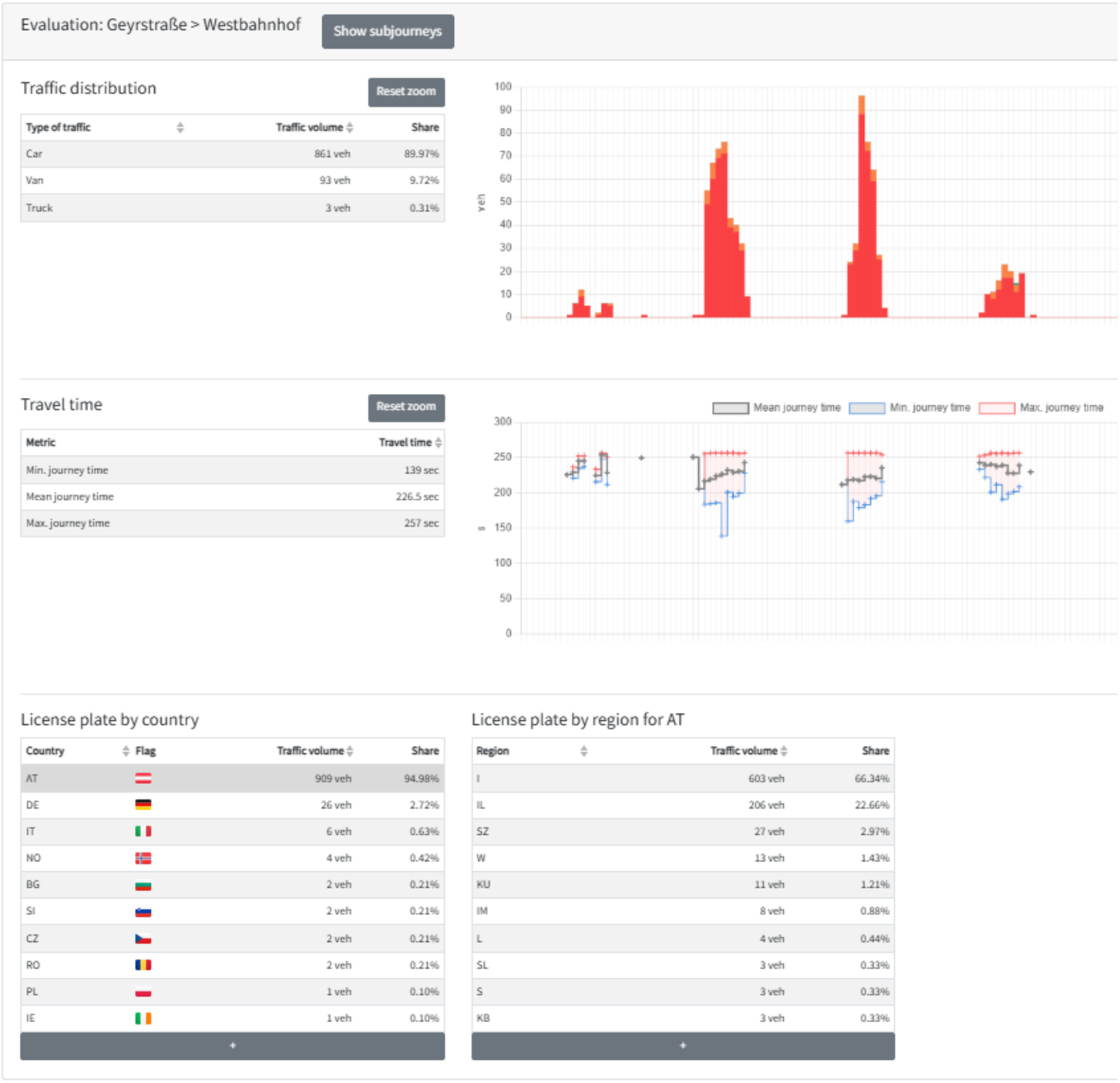


Figure 4: Evaluation

Show subjourneys: If nodes of the midpoint type have been defined, subjourneys can also be displayed between cordon points. This gives you a more detailed evaluation of the relationships between cordon points via midpoints.

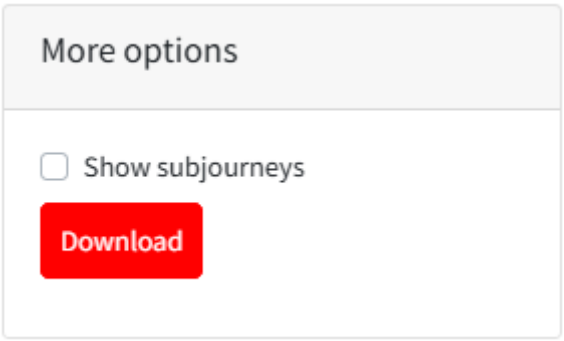


Figure 5: Show subjourneys

Dynamic Journey Time Filter

The **Dynamic Journey Time Filter** allows users to define travel time limits both globally for all links and individually for specific links. Changes can be applied temporarily or saved permanently. This feature enables flexible and precise control over which connections are displayed. In the analysis, journeys whose travel times fall within these limits are counted as through traffic.

Purpose & Benefits

The Dynamic Journey Time Filter offers:

- flexible adjustment of travel time boundaries
- efficient and targeted data filtering
- improved transparency through link-specific configurations
- reusable filter setups thanks to persistent storage

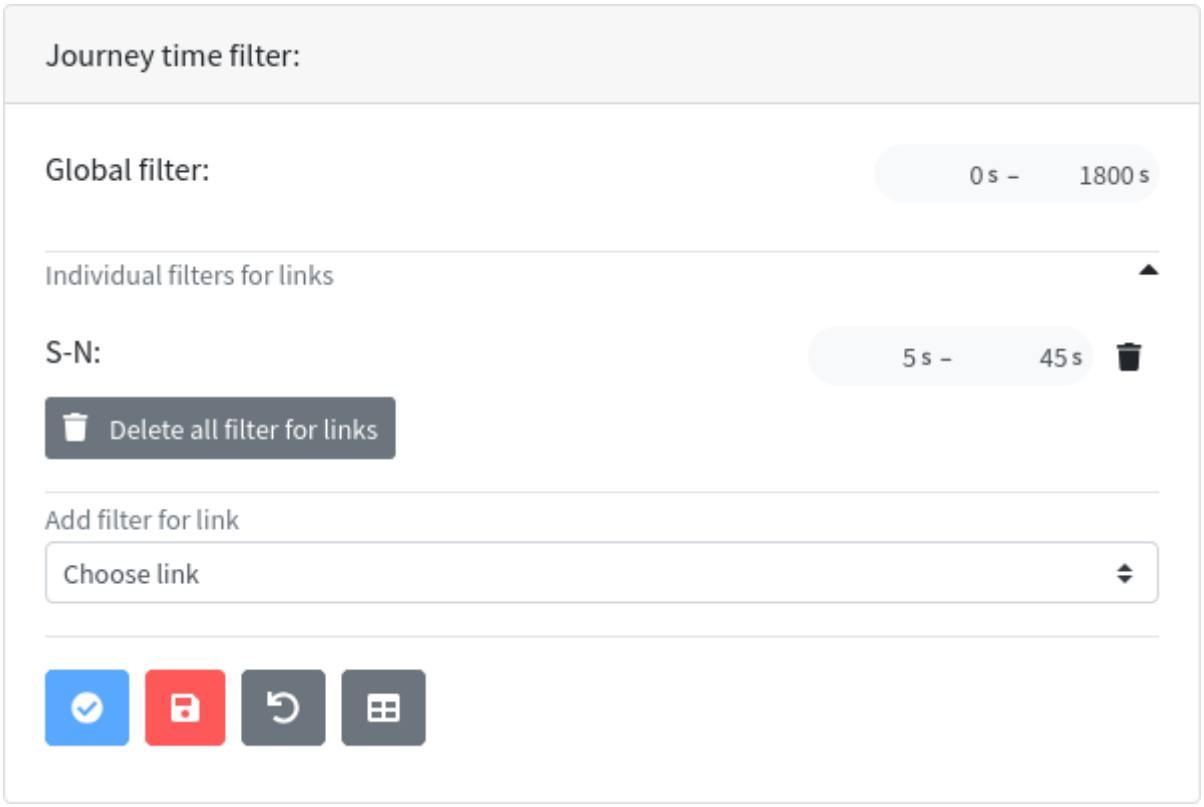


Figure 6: Dynamic Journey Time Filter

Overview of Components

Global Filter

The global filter defines the default minimum and maximum travel time for **all** links.

- **Default value:** 0 s – 1800 s
- The global filter is applied whenever no individual filter exists for a link.
- Changes to the global filter only take effect after clicking *Apply*.

Individual Filters for Links

Each link can be assigned its own travel time filter.

- Individual filters **override the global filter**.
- An individual filter entry displays the defined time range as well as a delete icon (□).
- The *“Add filter for link”* dropdown allows users to create any number of link-specific filters.
- With *“Delete all filters for links”*, all individual filters can be removed at once.

Matrix View

The matrix button navigates back to the **travel time matrices**, where the filtered link data can be viewed in a tabular format. A calculation helper based on speed and air distance is available. This view displays the most recently saved values.

Two matrices are shown. The first represents the lower bounds of the travel time filters for individual links. The second shows the upper bounds of these filters. If no individual filter is defined, the cell is greyed out, and the global filter settings apply. The matrix displays the start nodes in the first column and the destination nodes in the first row.

By **double-clicking** a greyed-out cell, it becomes active, allowing an individual filter to be set for that specific link.

Click **“Save changes”** to permanently store the entered values.

Click **“Discard changes”** to reset all modifications.

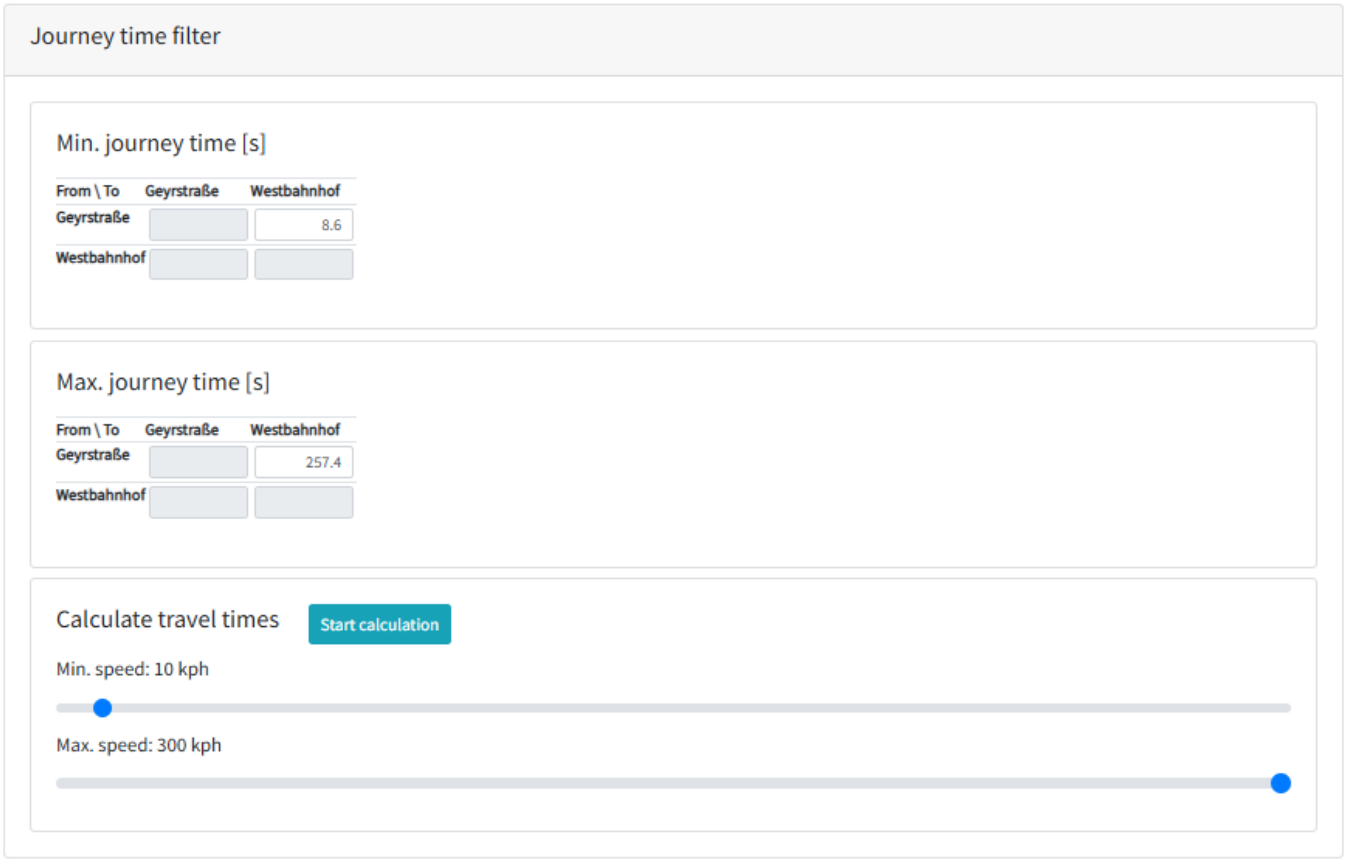


Figure 7: Matrix View

Calculate Travel Times

Here you can calculate individual filters for all links based on speed and air distance. Click **“Start calculation”** and the filters will be computed and then saved automatically.

Actions and Buttons

✓ Apply

- Applies the currently configured filters (global + individual).
- Triggers a recalculation or re-filtering of the displayed data.
- Changes are **temporary** until new values are applied or saved.

Save

- Permanently saves all current filter settings.
- Saved values are restored automatically when the application is reloaded.

Reset

- Reverts all changes made since the last save.
- Restores the previously saved state.

Delete All Filters for Links

- Removes all individual link filters.
- Afterward, only the global filter is applied.

How the Filtering Logic Works

1. **Individual filters take priority:** If a link has an individual filter, only that filter's time range is applied.
2. **Fallback to the global filter:** For links without an individual filter, the global filter is used.
3. **Filtering of data:** After clicking **Apply**, all links are re-evaluated and filtered according to their corresponding filter settings.

Data export

The data can be exported in the form of an Excel table.

	A	B	C	D	E	F	G	H	I	J
1	Survey: Südring (Release Briefing - Do Not Touch)									
2	Dates: 2024-12-01 00:00:00 - 2024-12-08 00:00:00									
3										
4										
5										
6	From:	Geyrstraße								
7	To:	Westbahnhof								
8	Start time:									
9	2024-12-01 00:00:00	0								
10	2024-12-01 01:00:00	0								
11	2024-12-01 02:00:00	0								
12	2024-12-01 03:00:00	0								
13	2024-12-01 04:00:00	0								
14	2024-12-01 05:00:00	0								
15	2024-12-01 06:00:00	0								
16	2024-12-01 07:00:00	2								
17	2024-12-01 08:00:00	10								
18	2024-12-01 09:00:00	43								
19	2024-12-01 10:00:00	45								
20	2024-12-01 11:00:00	75								
21	2024-12-01 12:00:00	43								
22	2024-12-01 13:00:00	54								
23	2024-12-01 14:00:00	39								
24	2024-12-01 15:00:00	8								
25	2024-12-01 16:00:00	3								
26	2024-12-01 17:00:00	0								
27	2024-12-01 18:00:00	0								
28	2024-12-01 19:00:00	0								
29	2024-12-01 20:00:00	0								
30	2024-12-01 21:00:00	0								
31	2024-12-01 22:00:00	0								
32	2024-12-01 23:00:00	0								
33	2024-12-02 00:00:00	0								
34	2024-12-02 01:00:00	0								
35	2024-12-02 02:00:00	0								
36	2024-12-02 03:00:00	0								
37	2024-12-02 04:00:00	0								
38	2024-12-02 05:00:00	0								

Car | Van | Bus | Truck

Ready Accessibility: Good to go

Figure 8: Excel export

It is also possible to access the data via our API.

Data Center API

The BERNARD Data Center API provides comprehensive options for querying data for both stationary and moving traffic. This API allows developers to easily access metadata and retrieve traffic data and aggregated statistics.

Authentication with a Bearer Token is required to access the API. Please add a Bearer Token to your request header to authenticate yourself.

For detailed information on the parameters and return values of the individual endpoints, please read the corresponding API documentation.

https://datacenter.bernard-gruppe.com/api/v3/docs

If you have any questions or problems, please contact our support team.