



Optimising urban public transport

Revolutionising operational quality with Business Intelligence and AI

Digitalisation has fundamentally changed urban public transport. Today, transport operators face the challenge of generating large quantities of operational data and evaluating it appropriately in order to boost their service quality.

Valuable data source

Business Intelligence (BI) and artificial intelligence (AI) offer huge potential here for optimising operational processes and taking informed decisions. Using a BI solution brings many advantages for transport operators: you become far better acquainted with your company and how it is performing. Operational data is a valuable data source that can be used with Business Intelligence applications for many evaluations.

LIO-BI2: The highlights at a glance

- Reliable and high-quality data base
- Multi-dimensional data analyses
- Individual report design
- Numerous export interfaces
- Simple operation using web interface
- Scorecard reports with drill-down function
- Automatic report generation and e-mail transmission
- Flexible access control

Among others, you can analyse how well transfer protection or traffic light preemption is working, or examine service quality with a punctuality evaluation – of the entire operation, of a certain route or of individual trips.

Extensive filter criteria are available to produce the desired view of these data. BI analyses let you profit from the following improvements, for example:

- substantive arguments as a basis for discussion
- simplified decision making
- more precise planning and predictions
- lower costs
- higher service quality

You too can benefit from these and other advantages, which is why we'd now like to introduce you to our LIO-BI2 solution.

Structure and advantages of our BI solution

When it comes to Business Intelligence (BI), ebblo has developed LIO-BI2 as a strong tool – or rather a strong tool box that can be configured specifically in accordance with a company's individual needs. LIO-BI2 generates extensive data from the operational control system and makes it available in easily understood reports.

The LIO-Scope add-on provides interactive, flexible evaluation possibilities. This allows specific tracking of how operational indices are trending, with thorough analysis of operational developments and processes. On this basis, transport operators can make their operations even more effective and their service even more attractive.

Data acquisition and analysis

The potential lies in efficient acquisition of detailed data which can be made available to a large audience through the web technology used. This provides the LIO-BI2 users with extensively and precisely prepared data.

LIO-BI2 supports the evaluation of data from different system components, with the user selecting which topics are to be analysed. Numerous reports enable reliable measurement and evaluation of key criteria indicating the quality and performance of day-to-day operations.

Interfaces

Integrated export interfaces can be used to make the recorded data available to various other consumers. It is thus possible, for example, to make passenger numbers and departure times available simply and reliably to other file import systems.

Web-based operation

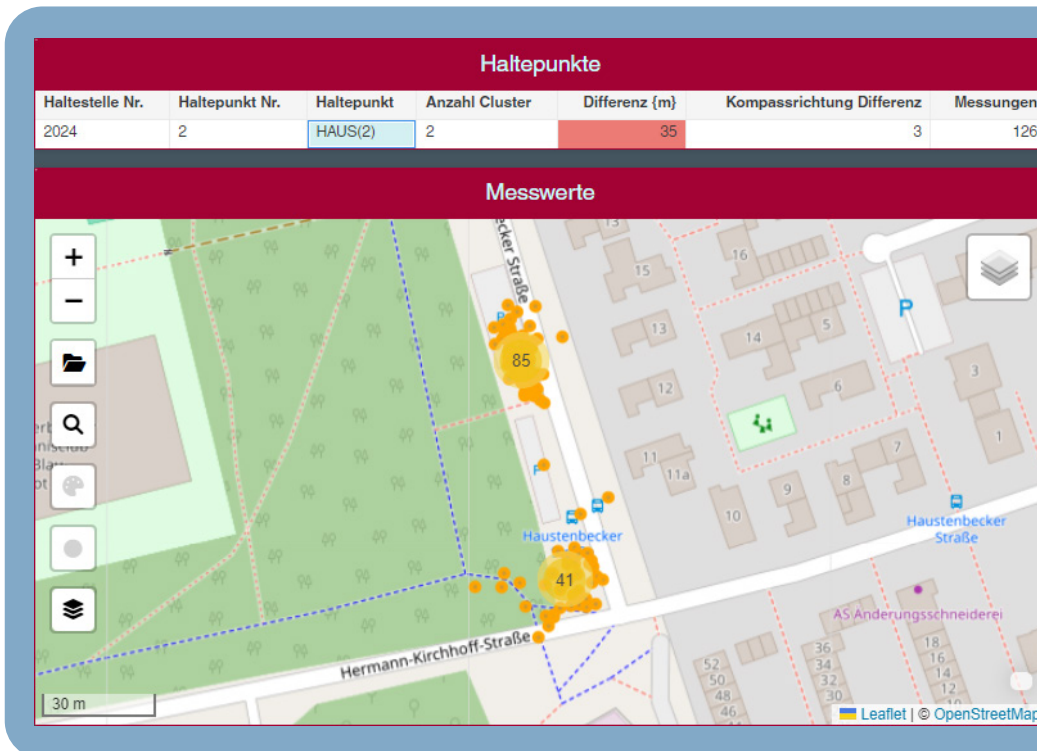
The web interface stands out with easy operation and user-friendly access to predefined reports. Individual users see only those reports that they are authorised to view. Technicians thus have access to device error messages, or operations schedulers can analyse completed trips.

Scorecard reports

LIO-BI2 can be used, for example, to generate reports for a certain operator, a certain route or a certain vehicle. A so-called drill-down function is available for refining the analysis step-by-step.

Automatic generation and e-mail transmission

Reports can also be generated automatically with LIO-BI2. Based on the integrated subscription function, individual reports are created on a daily, weekly or monthly basis or at defined points in time. The reports are then made available as a file or sent automatically by e-mail.



The AI-based quality assurance function supports public transport operators in verifying stop location coordinates.

With the TLP quality management function in LIO-Scope, traffic flow can be analysed and systematically improved.

Linie		Richtung	Meldepunktkette		Durchschnittliche Verlustzeit (s)																					
					0	1	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	A	9032	K903-2 (4, 9) Richtung UNI		4		7	5	5	5	6	6	7	6	6	6	10	6	6	6	6	6	6	6	6	4
1	A	9472	K947-2 (4, 9) Richtung UNI		4		6	3	5	5	6	5	5	6	4	6	6	6	5	4	5	5	6	5	5	4
1	A	9482	K948-2 (9) Kaukenberg		13		18	13	14	16	19	15	17	14	15	16	16	17	15	16	17	16	16	16	14	14
1	A	10104	K101-4 Westertor (aus Richtung HBF)		25		47	37	32	40	42	35	41	41	39	41	49	29	28	28	38	27	25	38	44	39
1	A	10202	K102-2 Bahnhofstraße / Florianstraße		4		5	6	5	7	5	10	11	6	15	7	18	21	17	9	4	4	4	6	8	6
1	A	10302	K103-2 Bahnhofstraße / Gruniger Straße		13		4	18	8	6	9	6	9	5	7	5	6	5	9	7	7	12	11	16	14	10
1	A	10402	K104-2 FU HBF		6		3	6	6	4	12	5	4	4	10	9	10	7	4	6	3	3	6	6	4	
1	A	10503	K105-3 (8) Neuenbeken		40		37	35	45	36	36	48	49	41	39	36	48	36	46	34	41	27	36	33	39	
1	A	12202	K122-2 (68) Schöne Aussicht		9		18	10	18	21	30	22	15	22	27	23	19	23	20	19	22	20	18	8	7	
1	A	12301	K123 (68) Schöne Aussicht		2		1	3	6	3	6	3	4	3	7	7	3	3	6	4	4	4	3	3	3	
1	A	12402	K124-2 (68) Schöne Aussicht, UNI Uni		12		8	7	10	9	7	6	8	13	11	5	13	7	10	11	5	6	7	8	7	
1	A	14603	K146-3 (1) Hauptbahnhof		7		7	6	11	10	12	15	8	15	8	15	11	15	9	12	7	7	7	7	4	
1	A	15101	K151 Marienloh/Kaukenberg				22																			
1	A	22203	K222-3 (4, 9) Richtung UNI		18		24	10	8	3	11	9	7	4	10	9	6	12	6	4	9	9	2	11	15	18
1	A	22302	K223-2 (4, 9) Richtung UNI						42	28	39	40	16		19	38		18	33	17	19	36		27	17	
1	A	22402	K224-2 (4, 9) Richtung UNI		29		28	37	42	35	52	47	43	46	42	41	41	46	44	47	38	43	45	41	20	24
1	A	22902	K229-2 (4, 9) Richtung UNI		3		5	3	3	4	4	2	2	5	3	1	6	8	3	4	3	2	2	3	2	
1	A	25301	K2534 (4) Dahl		25		17	21	16	27	18	21	21	34	25	31	27	25	34	27	23	25	17	18	21	26
1	A	25402	K254-2 (4, 9) Richtung UNI		-1		1	-1	-1	-1	0	-0	0	3	0	1	6	1	2	4	2	3	3	-1	-1	-1
1	A	30101	K301 Detmolder Tor		10		8	11	11	10	10	15	25	11	39	13	147	20	19	27	11	14	52	15	15	20

Possible uses for LIO-BI2

Flexible data analysis and individual evaluations

With LIO-Scope, ebblo offers an extensive add-on to the LIO-BI2 solution. LIO-Scope allows transport operators to define analyses and evaluations themselves, individually defining both the selection of the desired parameters (attributes and metrics) and how these are visualised.

LIO-Scope is suitable for users interested in highly varied evaluations of their operational data. It can be used, for example, to answer questions such as: "On which days and at which times are our vehicles overcrowded and delayed?" LIO-Scope can also be used by those who do not want to produce their own evaluations or who do not have the human resources to do so. ebblo offers both individual consulting and the development of evaluations and reports as a service.

AI quality assurance interface to the data supply

Artificial intelligence (AI) is already incorporated in LIO-BI, further enhancing the user experience. One important use case is the AI quality assurance interface to ebblo's LIO-Data data management. This interface offers a fast, precise and efficient way of optimising operations and further improving the quality of urban public transport.

The AI interface and the evaluations within LIO-BI2 make it very easy to visualise and improve all problems relating to travel distances between stopping points and coordinates of stopping points. But how does this work?

The on-board computer records the actual distance travelled between two stopping points as well as the GNSS coordinates and compass bearings at all stop-

ping points. LIO-BI2 uses advanced algorithms for data cleansing and analysis of the location data to identify deviations between planned and actual data. These analyses permit precise optimisation of the travel distances between stopping points, significantly improving the punctuality and reliability of local transport.

It might sound complicated initially, but it brings crucial advantages for the data supply staff:

- Time savings through automated calculations, less workload for supplying distances and coordinates, automation of repetitive jobs
- Accuracy thanks to AI-supported calculations, precise distance information and coordinates for reliable decisions, simple identification of planning errors, shifted or incorrectly placed stopping points
- Improved locating thanks to precise geo coordinates of the stops, more exact tracking and traffic light preemption
- Reliable passenger information thanks to exact stop coordinates and travel distances

TLP quality management

Efficient operations and an optimum traffic flow depend on precise traffic light preemption. TLP quality management evaluations in LIO-BI2 and LIO-Scope compare the planned and actual triggering of reporting points, quickly showing whether the junction controllers are actuated smoothly and as expected.

Triggering accuracy is ascertained on the basis of comparisons between distances and coordinates. Correct functionality is checked by analysing the vehicle speed between reporting points, as well as passage duration and TLP time losses for reporting point chains. This permits detailed evaluation along specific routes.

The analysis results allow for efficiency enhancement, data-based decision making, optimised traffic planning and clear cost savings with the omission of manual measurements.

Documentation of trip cancellations and mileage performance

In many cases, transport operators have to provide their clients with evidence of mileage performance and whether there were any trip cancellations. Once again, a BI function provides valuable support here. Modifiable mileage reporting facilitates precise documentation and analysis of trip cancellations and mileage performance.

The function offers possibilities for both automatic and manual adaptation, together with a predefined, configurable set of rules that can be aligned flexibly to specific operational requirements. If it should happen that vehicle files are lost, alternative data sources can be used to justify mileage performance and minimise financial losses. Comprehensive analysis of mileage performance – per trip and broken down into various performance categories – creates transparency and makes the operational workflows comprehensible.

Modifiable mileage performance reporting allows for identification and proactive remedying of recurrent problems. This in turn has financial advantages when

cancellations not caused by the transport operator or extra services are reimbursed by the contracting authority.

Electromobility evaluations

Electric vehicles bring a number of challenges for transport operators, particularly in terms of keeping an eye on the available range of the individual vehicles, as well as battery temperature. The dashboards and reports for analysing electromobility offer a comprehensive solution for these challenges.

Transport operators gain detailed insights into the energy consumption and condition of their electric fleets. Analysis based on functions for monitoring energy efficiency, battery temperature and the state of charge permits efficient, low-cost operations management and promotes sustainable operational processes.

Evaluations in LIO-BI2 allow users to proceed with exact, individual analysis of energy consumption in their electric buses. The evaluations offer crucial advantages for transport operators:

- Cost savings by optimising energy consumption and extending the battery service life
- Efficient fleet management and optimised operational processes
- Higher fleet reliability thanks to detailed monitoring and analysis

Further information

Integrating Business Intelligence and AI in the operational workflow of transport operators represents decisive progress. Systems such as LIO-BI2 and LIO-Scope let companies enhance their efficiency, while improving service quality at the same time. Given the rapid developments in digitalisation, opting for such innovative solutions is indispensable in order to meet the increasing demands in urban public transport. Would you like more information about these or other functions? Please do not hesitate to contact us.



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