

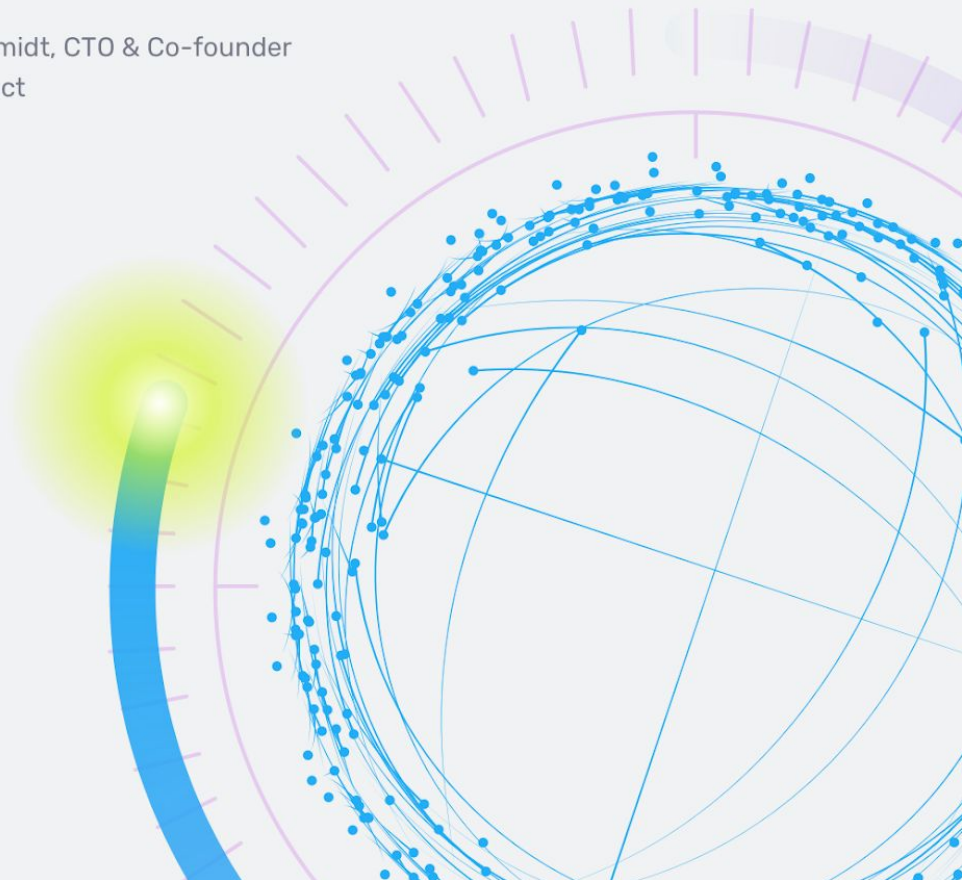


How Total's WayKonecT Uses InfluxDB Enterprise to Turn Data into Insights to Help Drivers Improve Fuel Efficiency and Safety

AN INFLUXDATA CASE STUDY

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June 2018

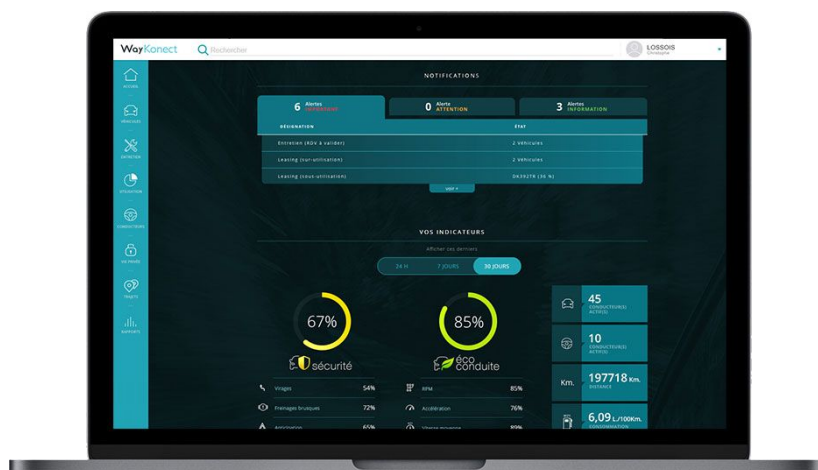


Company in brief

WayKonec is the Total connected fleet management solution. It consists of a unit connected to the vehicle which provides feedback on all information needed for efficient fleet management. The goal is an ethical approach based on ecology, cost reduction, fleet improvement and efficiency by giving everyone involved a clear and objective view of the condition of a vehicle, how it is being utilized or its consumption, while being easy to use and providing significant advantages to every driver. The WayKonec solution enables both fleet managers and drivers to access specific information about the vehicle, including its maintenance log, technical inspection reminders, fuel consumption and mileage, or finding a vehicle in a parking lot at any time. WayKonec joined the Total group in June 2018, intent on pursuing its goal of revolutionizing the connected professional vehicle.

Case overview

WayKonec wanted to build an intelligent, driver-centric fleet management solution that would comply with GDPR data privacy requirements while enabling transparency for each of their customers into their fleet. To achieve that, they needed to automate raw telemetry storage using a highly scalable and available time series database that would meet their high ingestion and variable retention requirements. WayKonec chose InfluxDB Enterprise, the enterprise time series database from InfluxData, to gather data and turn it into insights to help drivers improve fuel efficiency and safety. Their proactive tools optimize all aspects of fleet management, both maximizing performance and minimizing costs.



WayKonec dashboard

“Cars are very expensive both to buy or lease and to maintain. In addition to that cost, accountability and information about them is very hard to come by and harder even to trust.”

Jonathan Schmidt, CTO and Co-founder

The business problem

WayKonec’s focus is on data analysis and actionable intelligence from vehicles and they take a driver-oriented approach to the field. They use telematics trackers in cars to get telemetry from the onboard computers such as position, health, and maintenance to be carried out on the vehicle. Their specialty is data analysis. They are hardware-agnostic, so they connect directly to the cars. They use trackers when applicable as well as geolocation beacons.

WayKonec has a driver-centric approach since drivers are responsible for more than 50% of any cost incurred for a vehicle – be it the way it’s driven, how much it’s driven, to gas consumption, and sometimes accidents. WayKonec’s motto is “enabling privacy while promoting transparency within an organization.” They promote transparency about how a car is used, why it is used, and how it’s maintained. However, privacy is important to WayKonec, especially in France and in Europe. So their solution, as its core, allows end users (drivers) to request not to be followed with the geolocation information gathered. Despite not being able to follow drivers in that case, WayKonec still needed to aggregate data on how many kilometers were driven, how the car was driven, and how much gas was consumed so that everybody in the company has a clear picture of car usage and driver performance. That’s one of the pain points WayKonec was trying to solve for companies given cars’ high cost of purchase and maintenance. Though WayKonec has a partner network that allows it to maintain cars cheaper, it still had to meet its promise: \$650 per year per vehicle in savings, including the cost of its solution, and 50% less time spent on fleet management for the fleet manager.

The technical problem

WayKonec needed an automated way to store and aggregate vehicle data in real time while maintaining data privacy in compliance with GDPR requirements and efficiently handling geotemporal data. They had been relying on physical logs from their drivers, who regularly documented their mileage, odometer, and trip information. But manual methods are error-prone and time-consuming since most drivers either have documentation lapses or make mistakes in preparing a report due to the

sheer volume of figures involved. When that data is entered into an Excel sheet or another IT system, one in four numbers tends to get written incorrectly due to typos. Since such data is hard to get and harder to trust, WayKonec set out to digitalize the driver log process using a time series database that would meet their technical and legal requirements.

The solution

“So scalability really was the operating word here. And that’s why we actually chose InfluxDB Enterprise.”

Why InfluxDB Enterprise?

WayKonec chose InfluxDB Enterprise because it met their criteria:

- **1 Hz sampling is a lot of data** - WayKonec was one of the first companies on the market to do 1-Hertz sampling on their vehicles (10 - 40 columns), depending on the vehicle. At first, WayKonec used flat files(CSV) to record the information but that failed to scale. Even with one file per vehicle per day, it was a nightmare to maintain and very hard to write and reread after that. InfluxDB was a good fit since it is a purpose-built time series database designed to handle high write and query loads.
- **Hardware-agnostic means variety** - WayKonec also chose InfluxDB for its schemaless design. Being hardware-agnostic meant they have a lot of variety in their data. A geolocation beacon would only give them latitude, longitude, and sometimes heading and speed whereas a full-blown telematics tracker would provide 20, 30, 40 data points every second about the vehicle. All these points have to be entered. Since no two telematics trackers have the same columns or names, it was necessary to synchronize but also be able to add columns as you go.
- **Industrial data** - missing and duplicates are par for the course - Another reason was the way InfluxDB handles duplicates and data overwrites upon collisions. Industrial data collected by a telematics system varies between being very stable to not being stable. Missing data and duplicates are common. So is having a tracker send completed data or added-value data afterwards on an already recorded timestamp. With InfluxDB, you don’t lose data by rewriting a line.
- **High availability and scalability** - WayKonec is a company dedicated to a solution that can run 24/7. High availability was needed because cars run anytime, anywhere, and because the WayKonec solution is a SaaS, which means users can access their portal at any time. Since scalability was crucial for them, they set up an InfluxDB Enterprise cluster. Their estimates put them at about 200,000 vehicles to start stressing the hardware on it. They have confidence

that they can meet and exceed the required scale by scaling the hardware up and then scaling out after that.

WayKonec also use InfluxDB for infrastructure alerting and monitoring. They collect metrics not only about the trackers themselves but also their infrastructure, which feeds metrics data into InfluxDB, and then visualized with Grafana.

Visualization and graphing are also part of the WayKonec solution. For their SaaS offering, they develop their own visualization tools and feed data from InfluxDB to show vehicle's trips and routes. This is overlaid on OpenStreetMaps and other standard mapping tools.

Connected fleet management solution

The WayKonec solution consists of a unit connected to the vehicle which provides feedback on all information needed for efficient fleet management. The solution is connected to the OBD socket (vehicle diagnostic plug), with Y-wiring. The major advantage of an OBD plug is the installation time (roughly 15 min) as well as the ease with which it can be exchanged in case of any failures. This connection provides a direct and permanent connection to the fleet.

The WayKonec solution enables both fleet managers and drivers to access specific information about the vehicle, including its maintenance log, technical inspection reminders, fuel consumption and mileage, or finding a vehicle in a parking lot at any time.

WayKonec units are equipped with a 4G multi-operator chip that allows the company to collect data by the second and down to the nearest meter anywhere. In areas where network coverage is poor or non-existent, the unit's buffer memory takes over (storing data until it reconnects to the network) in order to guarantee the reliability of the data collected over time.

A driver-centric approach

Driving behavior accounts for half the costs associated with a vehicle (fuel, maintenance, claims, consumables). Thanks to a dedicated mobile application, WayKonec enables managers to be directly connected with drivers. Drivers enjoy better safety and more relaxed driving, while contributing to reducing company costs and also being rewarded personally.

Managing driver privacy

WayKonec's solution is respectful of driver privacy. The solution is developed in compliance with the applicable regulations and the French National Commission on Informatics and Liberty (CNIL) recommendations for connected devices and with the data privacy law (Loi Informatique et Libertés). In accordance with CNIL regulations in force, GPS positions are kept for a period of two months, after which they are anonymized. WayKonec has set up a privacy mode which allows drivers to disable geolocation outside of their working hours, directly from their smartphone.

Technical architecture

“Handling data collisions correctly was very important for us. And that’s something InfluxDB Enterprise does beautifully.”

WayKonec’s data architecture is as follows:

- WayKonec use Kafka as a messaging backbone for the infrastructure. They collect the telemetry from the cars and then bufferize it on the trackers themselves. For car manufacturers, data is usually transit via their servers to a standard HTTP endpoint outside. Most trackers bufferize the telemetry and send an HTTP call, such as a POST call, every one or two minutes.
- This call writes straight to InfluxDB and to Kafka. It writes all the data to InfluxDB, and what they need in order to calculate metadata, into Kafka.
- The WayKonec architecture has few workers that read the data from Kafka and input it into Neo4j graphs database, which holds data for the vehicles, drivers, trips, and events (when they have something special to note like driver identification or accidents). This also tracks maintenance.
- Every user and metadata is in Neo4j, and the workers and SaaS console write to it.
- All other raw telemetry, including positions, is on InfluxDB. This why WayKonec needed configurable retention policies in InfluxDB.

WayKonec’s approach to creating and structuring schema in InfluxDB is as follows:

- WayKonec try to follow one rule about schema: one timeline means one series. Since collisions overwrite data, they have one physical device per series. Sometimes when they have duplicate messages on multiple channels, on which a vehicle can handle messages, they divide messages by channel.
- For WayKonec, a Tracker is a unique identifier for a telematic solution, and MessageType tracks metrics across multiple channels to see if a channel is doing poorly.
- With InfluxDB, cardinality – rather than individual tags – is key for scalability. When designing schema, it’s not the number of tags that should be taken into account but their variability.
- They use the Group By to group by tags (InfluxDB does not group by fields). Whenever grouping by a parameter is required, they set it as a tag. If it impacts cardinality, then they weigh the tradeoff.
- In setting tags and grouping by tags, they plan ahead and take time with the first schema to get it right for present and future purposes. This is because changing a tag plan can be painful

since the entire data set will have to be forklifted into the new tags. In contrast, they found adding tags to be easy.

- Retention can cause errors on write when points go outside a retention policy duration. For example, writing data points that are two months old while having a one-month retention policy results in an error. That can lead to wondering why your implementation refuses to write data on the development environment, where the retention is small, yet it works on the production environment where the retention policy is longer. That's something good to have in your code base because it's one less thing that can go wrong if someone feeds false data into a database.

Handling private information in compliance with GDPR

On the 25th of May 2018, GDPR went into effect in the EU, and anybody handling personal data from anyone in the EU needs to comply. This meant people have a right to be forgotten, and personal data can be kept for only so long. Such data includes position, geolocation, latitude, and longitude. So the WayKonec solution was limited to a two-month storage period for personal data, after which they have to destroy it. But that's not the case for non-personal data such as speed, gas remaining in tank, or RPM per second, which fall under another retention policy and can be kept for statistical analysis. Using InfluxDB's flexible retention policies, WayKonec expire personal driver data automatically at the end of the retention period while storing non-personal data for longer periods. Below are their practices and observations on handling private data:

Benefitting from InfluxDB Retention Policies

- Files are automatically tombstoned/deleted: To comply with regulation, WayKonec needed to be able to completely delete a series if it contained personal information. That meant their schema and tags must reflect this requirement. To avoid deleting multiple users' information at once, WayKonec gave every user his or her own series.
- Retention time is retention + shard duration: WayKonec have finite timings on how long they can keep data. The correct retention time for information in InfluxDB is the designated retention period plus the shard duration. For example, in a one-month retention policy with a shard time of one day, InfluxDB will create one shard every day for a month. Then for the 31st day, it will create a new shard and delete the older one. With InfluxDB, it's recommended to have a longer shard duration, which should be taken into account in setting a retention policy.
- Small shard duration is detrimental to performance: Shard duration is important for performance, but that doesn't mean it should be reduced to the minimum because InfluxDB will then have to address multiple shards to answer a query. Striking a balance is necessary between shard duration, the retention period, the company's requirements, and driver privacy.

- Writes older than the retention period are rejected: Inflating shard duration and having a very small retention period should be avoided (so that you can keep data and delete it at the right point without having very high shard count).

Queries across policies are possible

Even when they had transformed their schema and system to handle privacy, they needed to make only a small adjustment to their queries to perform queries across retention policies.

Watching out for backups

Backups are covered by GDPR, and sometimes conflict with it because, as a tech company in France, WayKonec is required by law to keep a journal of transactions and backups of user data. But these backups also fall into the GDPR privacy timings. When WayKonec backup InfluxDB, they make sure either not to back up the privacy data or to back it up in a separate file that can be deleted once the allowed storage duration ends.

Handling geotemporal data

Geotemporal data is data that evolves over time on a fixed point and can be measured on multiple points on earth. WayKonec's use case involved series that map out to places on earth, and using InfluxDB Enterprise, they can index the place and time. Here are some of their insights in that regard:

Single-value Geodetic systems make good tags - There are few single-value geodetic systems (coordinate systems) like Geohash or Military Grid Reference System (MGRS), which allow you to encode location data into one string, to create tags, and index them correctly in InfluxDB Enterprise. Such systems are more efficient than using latitude and longitude, which are poor tags to use since they cause very high cardinality.

Cardinality is the biggest issue for geotemporal data - With a lot of sensors all over the world and the need to handle a lot of traffic and ride information, WayKonec has lots of points on earth. Setting a geohash, which can be up to 12 characters long, as a tag results in 1,000 - 1 million trillion series. Handling geotemporal data and user ID creates high cardinality, so WayKonec use fields when handling geotemporal data, and use tags only for the positioning. They use two series per tracker for the telemetry information and two series per tracker for metrics. They have a few thousand trackers today, so their cardinality, including their sandbox environment, remains under 50,000. This currently works well with double-core CPUs and about 8 or 16 gigabytes of RAM, on their two-node cluster.

Optimizing the use of Geohash - Geohash is a convenient way of expressing a location (anywhere in the world) using a short alphanumeric string, with greater precision obtained with longer strings. A one-character geohash is about 5,000 square kilometers large on earth. When you're down to five characters, you are at five square kilometers. Then you can reach sub-meter or a few millimeters of precision with 12 characters, i.e. the size of a postal stamp. Yet the more characters you have, the more

cardinality you encounter. At five characters, you are already at 33.5 million series, which would stress existing hardware.

Geohash Example

u	5000 x 5000 km	32 series (5 bits)
u1	1250 x 625 km	1024 s.
u14	156 x 156 km	32k s.
u140	39.1 x 19.5 km	1 million s.
u140h	4.89 x 4.89 km	33.5 million s.
u140h9	1.22 x 0.61 km	1.07 billion s.
u140h9r	153 x 153 m	34.3 billion s.
u140h9rr	38.2 x 19.1 m	1.1 trillion s.
u140h9rrm	4.77 x 4.77 m	...
u140h9rrmu	1.19 x 0.596 m	
u140h9rrmu8	149 x 149 mm	
u140h9rrmu87	37.2 x 18.6 mm	

1 second = 1 billion nanoseconds

To encode data, WayKonec recommend using either one of two possible tricks:

- Limiting tag size to a suitable number such as four or five characters (when you have data that comes from everywhere on earth) and randomizing sub-precision time (any time component that is outside what's needed for precision). Let's say you have 1-second precision – everything from the 10th of a second to the nanosecond is data you will never need. But since InfluxDB Enterprise indexes data anyway, it can be used. You can input a random number (between zero and one billion minus one) as the data timestamp and therefore have a statistically insignificant chance that two data will collide and that you will lose one of the two.
- Encoding as much data in the Tag as it will allow and encoding the rest, the part of the time you don't need:
 - 1 Second precision gives you 29 bits (5 char.)
 - 1 Minute goes up to 35 bits (7 char.)

The 5 and 7 characters combined result in 12 geohash characters (the precision of a postage stamp), which is how WayKonec encode data in production.

- Five characters equate to, theoretically, 33 million series.

- Land mass on earth is roughly 30% of the total area on earth (10 million series).
- Roads typically represent less than 10% (under one million series).

WayKonecT also add a Field with a complete geohash for simpler queries. They can aggregate data on 1 geohash square down to 1 character, down to 12. Instead of setting one tag with the full five characters of geohash, they separated this into five tags to query each character separately. This gained them full control of a query and the support of the InfluxDB indexing engine.

Results

“Proactive maintenance management, vehicle geolocation, data reliability, coaching for eco-driving and safety... WayKonecT thinks of everything to make everyday life easier for professionals.”

WayKonecT, Total’s connected fleet management process, saves time and money in managing vehicle fleets. WayKonecT delivers advantages for fleet owners, fleet managers, and drivers.

For fleet owners: more savings

- **Considerable TCO savings** - WayKonecT’s advanced analytical capabilities help optimize fleet TCO by identifying its strengths and weaknesses.
- **Focus on safety** - To optimize driver safety, WayKonecT system includes tools that are involved upstream of the main causes of accidents.
- **Improve carbon footprint** - WayKonecT supports fleet owners’ efforts to reduce their fleet’s environmental impact.
- **Analyze more, spend less** - WayKonecT is an assistant and a coach as well as an efficient fleet auditing tool.
- **A communication kit dedicated to employees** - Deployment is supported with a communication kit that answers the team’s questions.
- **Adaptable to any vehicle, efficient in every industry** - WayKonecT adapts to the business (whether transport, trade, industry, first responder) and can be installed in all vehicles and utilities whether assigned or shared.
- **Test WayKonecT on the fleet** - The WayKonecT solution can be installed and tested on a sample of the fleet and for the period of choice.
- **Effortlessly installed** - WayKonecT adapts its logistical approach to fleet owners’ operating constraints and supports them every step of the way.

Fleeter platform for managers: monitor & manage

- **Automatic and Immediate data** - All vehicle data is pre-recorded, and managers receive feedback automatically with no additional manipulation or configuration.
- **The right decisions at the right time** - WayKonec is a true smart assistant enabling managers to visualize fleet emergencies and priorities at a glance.
- **Real-time fleet location** - Fleet managers can locate a vehicle that has broken down, find and contact the team closest to the location where they need it, and find out about traffic on an employee's journey.
- **Maintenance managed for you** - WayKonec provides vehicle maintenance alerts and suggests making an appointment.
- **Identify drivers** - WayKonec shows who drove which vehicle, where and when, since its intelligent badge system associates every journey with a driver.
- **Motivate teams and keep them safe** - Fleet managers can challenge drivers on their driving and improve their safety at the wheel.
- **Measurements, evaluation, numbers** - WayKonec can evaluate vehicle consumption, CO2 emissions, cost of maintenance or leasing contracts, driving time and compare data by category, vehicle, driver, or period.
- **Delegating is ok** - Fleet Managers can give employees access to all or part of the platform.

For drivers: service and safety

- **Drivers are in charge of their privacy** - WayKonec is primarily a working tool, and geolocation can be disabled at any time.
- **Personalized coaching for eco-driving and safety** - WayKonec analyzes driving behavior to help drivers consume less fuel, reduce wear on certain parts, and increase safety at the wheel through regular, non-intrusive notifications.
- **Maintenance managed automatically** - When the time nears for manufacturer maintenance or mandatory inspections, WayKonec informs drivers and enables them to add all their bills to the system, even for an unexpected fix.
- **A smart assistant in-pocket** - WayKonec assists drivers on a daily basis to make their work easier and save them as much time as possible.
- **Easily manage expenses** - WayKonec has an intuitive function for sorting driver expenses. No more messy voucher sorting for professional or personal travel.
- **Non-stop communication** - WayKonec's built-in instant messaging capacity enables drivers to chat with fleet managers and share many types of documents.

- **Practical services before taking the road** - WayKonec can tell drivers what useful services are nearby and can find the vehicle in case of loss or loan without parking place information.

InfluxDB, because it scales well, has freed WayKonec to focus on growth rather than worry about how to scale its infrastructure. In June 2018, WayKonec was acquired by Total, a pioneer in the fuel card market and related tools business. This acquisition was an acknowledgement of the value and professionalism of WayKonec's solution. With this acquisition, Total has boosted its digitized B2B fleet management offer, and Total's B2B clients now benefit from additional expertise developed by WayKonec.

About InfluxData

InfluxData is the creator of InfluxDB, the open source time series database. Our technology is purpose-built to handle the massive volumes of time-stamped data produced by IoT devices, applications, networks, containers and computers. We are on a mission to help developers and organizations, such as Cisco, IBM, PayPal, and Tesla, store and analyze real-time data, empowering them to build transformative monitoring, analytics, and IoT applications quicker and to scale. InfluxData is headquartered in San Francisco with a workforce distributed throughout the U.S. and across Europe.

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