



AN INFLUXDATA CASE STUDY

How Web Shop Fly Uses InfluxDB for Application Performance Monitoring to Become a Top Seller of Online Flight Tickets

Mirek Malecha

Director of Product Management,
Bonitoo.io



JUNE 2019

Company in brief

Web Shop Fly is a startup that has grown into a major online airline ticket travel agency operational in more than five European countries and Russia. It owns branches in Slovakia in Poprad and Košice. In the beginning, Web Shop Fly focused on securing all the necessary business, technology and partnership relationships needed for further development. In 2018, the company launched a unique search system for its clients, which is currently in the patenting process at the Czech Patent Office, with applications not only for the Czech Republic but for the whole European Union. Currently, Web Shop Fly operates its own flight search portal Letylevne.cz in the Czech Republic .

Web Shop Fly's mission is to build long-term and mutually beneficial relationships with customers, The company provides world-class technology and services that enable it to continuously increase its value. The key to success for Web Shop Fly has been a unique ticket search engine; high-quality customer service; an exceptional team; and excellent collaboration with Bonito.io, a software engineering company that provides end-to-end R&D Services. Web Shop Fly is exclusively designed, developed and operated by Bonitoo.io.

Web Shop Fly has strategic travel and media industry partners. These include LogiTravel, a Spanish travel agency operating in 11 countries in Europe, America and the Middle East. Other Web Shop Fly partners include the weekly Euro (part of the Mladá fronta media group) and Economia (by which Web Shop Fly started operating a direct ticket sales service on Economia's website). In August 2018, together with Prima FTV, Web Shop Fly launched the new travel portal PrimaGO, both for the Czech Republic and Slovakia. Web Shop Fly is preparing to expand into the nearest European markets. The Web Shop Fly group today consists of several portals including [letenkylevne.cz](#), [letenky.centrum.cz](#) and [primaGO.cz](#).

Case overview

Web Shop Fly needed an application performance monitoring solution that would provide real-time visibility into user activity and thereby implement their strategy of improving flight search and purchase experience. Yet with multiple portals in multiple countries, and in the context of a highly competitive industry and a complex online ecosystem, Web Shop Fly faced major challenges. They turned these challenges into market opportunities by starting with a solid plan and the right toolset.

Web Shop Fly's application performance monitoring solution is built on top of InfluxDB, an open-source time series database, used to collect and store user interactions and application metrics and events as well as send automated notifications in the case of errors.

Web Shop Fly uses standard metrics from Google Analytics, Hotjar and AWS Cloudwatch. They augment this with metrics that they collect from the instrumentation of their application, infrastructure, and business to get an understanding of user adoption, health of bookings, infrastructure and network health and performance. This comprehensive visibility, made possible through InfluxDB, helps them make UX improvements, respond quickly to anomalies and ensure the quality of the flight data.

The screenshot shows the homepage of the letenkylevne.cz website. At the top, there is a search bar with the placeholder "Kdy a kam poletíte?". Below it, there are fields for "Odkud" (Praha, Česko), "Kam" (Napříte město, stát nebo oblast...), "Období" (17. 6. - 31. 12. 2019 na 2 - 8 noci), and "Počet osob" (Jednosměrná, Zpět). A button "Radit podle oblibenosti, let s přestupy, O Kč - 29 525 Kč" is visible. The main content area displays several travel offers: "Chorvatský Split za 2 999 Kč" (image of the Sagrada Familia), "Londýn" (image of Big Ben and a red double-decker bus), "Barcelona" (image of Sagrada Familia), and "Řím" (image of St. Peter's Basilica). Each offer includes a "Prohlížet lety >>" button and a price like "Letenky od 1 272 Kč" or "Letenky od 1 598 Kč".

Web Shop Fly portal using InfluxDB for real-time processing and monitoring

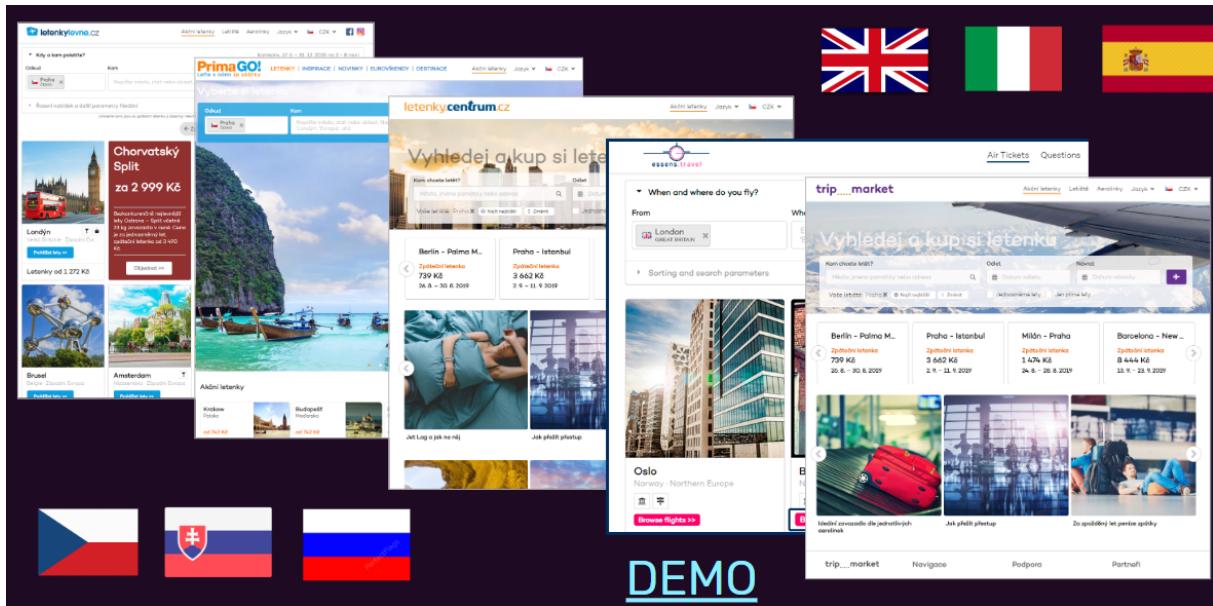
"We wanted to build something that would be fast enough, deliver best prices, and deliver fresh prices."

Mirek Malecha, director of product management

The business problem

The Web Shop Fly portal is integrated on one side with route and ticket providers. On the other side, the portal presents a search result with a unique layout that makes planning trips for end users easy and presents options that are tailored just for them. The application is highly optimized for the Central European market but is also entering other European markets as it grows.

Web Shop Fly: One System with Five Independent Portals in Six Countries



Apart from obvious fields in all air ticketing systems, the website offers a menu of additional sorting and search parameters (such as by popularity, price, destination, and destination distance).

Sort by popularity, flight with transfers, \$0 – \$1,795

Sorting and search parameters

Sort order: By popularity

Class: Economy, Direct, With transfers

Beach, Party, Shopping

By popularity, By price, By destination, By destination distance

Prices are roundtrip, tickets include all taxes and fees, but do not include baggage fees.

Destination	Price
Prague	\$56
Brno	\$57
Vienna	\$58
Nice	\$59
Düsseldorf	\$59
Berlin	\$59
Riga	\$59

Prague Czech Republic - Central Europe
Browse flights >>
Tickets from \$56

Brno Czech Republic - Central Europe
Browse flights >>
Tickets from \$51

Vienna Austria - Central Europe
Browse flights >>
Tickets from \$50

Nice France - Western Europe
Browse flights >>
Tickets from \$54

Düsseldorf
T

Berlin
T pm.on24.com is sharing your screen Stop sharing Hide

Riga
T

Users can select their outbound and inbound flights or just monitor flight price to their destination of interest by entering their email address to get notified of flight price changes to that destination. It's a simple interface where users can very quickly select the right flight for where they want to fly.

Sort by price, flight with transfers, \$0 – \$1,795

Sorting and search parameters

Sort order: According to price; Class: Economy; Transfer in: Anywhere; Beach, Party, Shopping

Price range: \$0 to \$1,795

Prices are roundtrip, tickets include all taxes and fees, but do not include baggage fees.

[Back to list of destinations](#)

Price	Departure date	Flight duration
\$46 ROUND-TRIP Choose >>	Outbound > Tue 1.10. 16:00 - 19:15 Ryanair < Inbound Wed 9.10. 20:35 - 21:50 Ryanair	2h 15min London (LTN) - Barcelona (BCN) Direct Nonstop 8 nights stay 2h 15min Barcelona (BCN) - London (LTN) Direct Nonstop
Flight Price Watching Turn on Provide us with your email address and we will periodically send you a notification with price changes of flights to Barcelona, on 6/24/2019 - 1/7/2020 for 2 - 8 nights. More info...		
\$46 ROUND-TRIP Choose >>	Outbound > Wed 2.10. 16:45 - 20:00 Ryanair < Inbound Tue 8.10. 19:50 - 21:05 Ryanair	2h 15min London (LTN) - Barcelona (BCN) Direct Nonstop 6 nights stay 2h 15min Barcelona (BCN) - London (LTN) Direct Nonstop

Web Shop Fly wanted to become the top seller of online flight tickets but faced steep challenges:

- Crowded market and global competition (many ways to access flight pricing, direct, indirect)
- Available frameworks don't allow for differentiation (everybody gets everything from the same kind of engine)
- Environment prone to price errors (search price can differ from flight price due to constantly changing air ticket prices)
- Customer easily disengaged (due to slow search response and price inaccuracy)

Market opportunity in real-time monitoring

Determined to overcome industry and market challenges, Web Shop Fly identified an opportunity to gain customers by improving its flight search and purchase experience. This required real-time visibility into user activity to determine user preferences — which could only be gained via real-time monitoring. Web Shop Fly set itself the following objectives:

1. Fastest search response: from over a minute to within **12 sec** (a five-factor of improvement)
2. Price accuracy: **> 95%** to conquer customer engagement and trust
3. **Optimum sorting**: availability & time range vs. cost & scoring
4. Shift from passive to **proactive** UI: by monitoring online website visitor activity in real time, they would be able to suggest instant attractive options to better meet customers' searches and preferences (helping visitors who are open to suggestions into a good deal, while not bothering those who know exactly what they want would not be bothered).
5. **Real-time** integration of online purchasing and support workflow: this requires that all customer activity be monitored, collected, analyzed and presented in reports. If website users faced issues or needed extra support, that support should jump in ready to help.

The technical problem

To achieve its business objectives objectives, Web Shop Fly deployed real-time data processing, monitoring, integration and visualization. Leveraging the visibility gained, they set out to provide better customer service response and more accurate flight and ticket information.

Web Shop Fly knew that they couldn't rely on off-the-shelf application monitoring tools to help them with their challenges. Instead, they determined that using the right tools to instrument their unique solution was the path they needed to take. They developed a solid plan and maintained a hands-on approach. Their strategy encompassed using direct APIs, Java and JavaScript instrumentation, InfluxDB and real-time alerts.

They realized that real-time processing is necessary since customers are impatient and that it would enable them to achieve the following SLAs as differentiators:

1. Search flights in **7 seconds** (instead of 30+ seconds)
2. Deliver **best prices** (high competition)
3. Deliver **fresh prices** (search price vs. final order price)

Once they had those targets very well-defined, they had to choose the right toolset for their strategy. They needed to put in place a scalable platform to collect time-stamped data. To ensure their back-end and front-end are integrated, real-time processing was also necessary. This led them to InfluxDB, which could meet both requirements.

Air tickets e-shop service architecture

The above three differentiators would have to be achieved in the context of the flight ticket e-shops' ecosystem. This encompasses many integrations – 700+ airlines, content providers & providers that aggregate APIs, online travel agencies (OTAs), metasearch engine APIs (i.e. Google flights) – while using a myriad of technologies (SOAP, REST, ftp, etc). A major challenge for Web Shop Fly was therefore balancing price accuracy, search time and cost – given that 500M flight combinations change every 10 minutes and that flight prices refresh capacity was limited (since API calls are not free). This required real-time monitoring of various types of metrics from various sources.

The solution

"Why did we select InfluxData? The first reason was very fast adoption. We were able to quickly create the events, push them into InfluxDB, and show the analytical views from InfluxDB to various stakeholders."

Why InfluxDB?

For real-time time series data ingestion and processing, Web Shop Fly chose InfluxDB because it is purpose-built to handle the massive amount of data, perform the needed operations, and present the data in the needed format as well as having real-time capability for alerting.

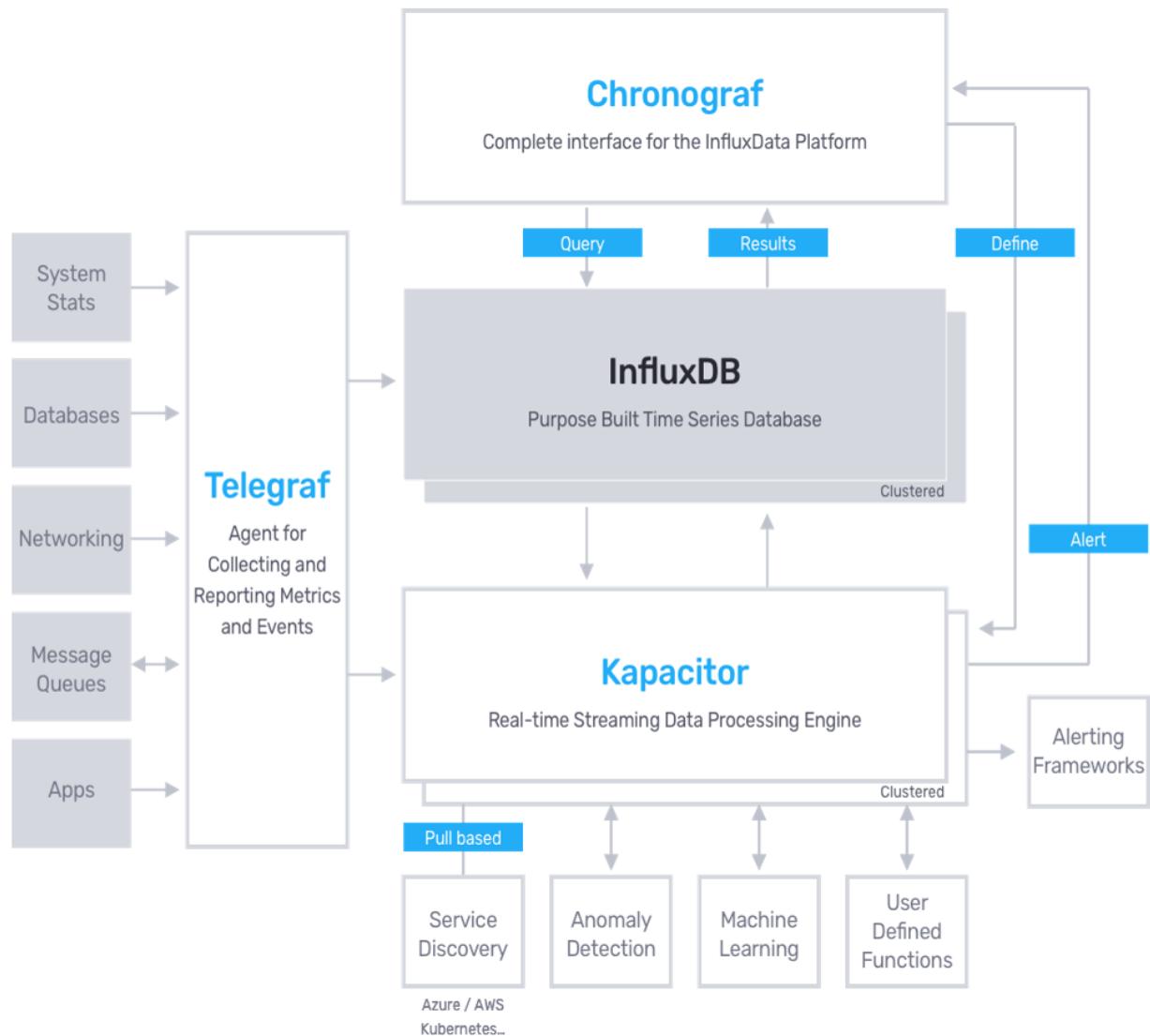
The InfluxDB time series platform helped Web Shop Fly create a real-time monitoring system very quickly and easily. Web Shop Fly uses InfluxDB time series platform for monitoring infrastructure metrics, application metrics and business-level metrics.

List of Web Shop Fly Monitoring Dashboards Divided into Three Groups
("A" for Application Monitoring, "B" for Business Metrics, "I" for Infrastructure Monitoring)

Name
A.1. Client Monitoring
A.2. Caching in Production
A.3. Interlining
A.4. Interlining Data Sources
B.1. Web Shop Fly Fixed Charts
B.2. Order Flow & Errors Analytics
B.3. Watchdog
B.4. Marketing Search Flight Analytics
B.5. Pricing Events Monitoring
B.6. Skyscanner Visitors
B.7. Web Shop Fly Production Real Time Center
C.1. MongoDB
C.2. MongoDB Workers
D.1. TEST Order Flow & Errors Analytics
D.2. DEV Client Monitoring
D.3. TEST MongoDB
D.4. Generated Flight Links Too Long
E.1. Cassandra Workers

They use InfluxDB for ingestion and storage, Telegraf agent for metric collection, Kapacitor for alerting, and Chronograf for data visualization. All these components of the stack come ready to use to help them instrument their unique environment.

InfluxData Stack Architecture



Web Shop Fly's reasons for choosing InfluxDB include:

- **Fast adoption, ready since day one:** They were able to quickly create the events, push them into InfluxDB, and show the analytical views from InfluxDB to various stakeholders (from infrastructure to applications teams), enabling these teams to create the specific views they need to be able to support, maintain, and improve the application.
- **Modest hardware requirements:** They have the current version of InfluxDB running on AWS, with InfluxDB's low on-disk storage requirements, it can handle a huge amount of events and additional information and be managed very effectively.

- **Disparate data collection:** Application libraries (e.g. Fibres), Technology (e.g. databases, hosting), Google Analytics, Hotjar, etc. This was made easy given the predefined connectors (Telegraf plugins) available that they leverage to capture the information.
- **Suitable for all, from infrastructure to business monitoring:**
 - User adoption
 - Order notifications
 - MongoDB health and performance
 - Network traffic

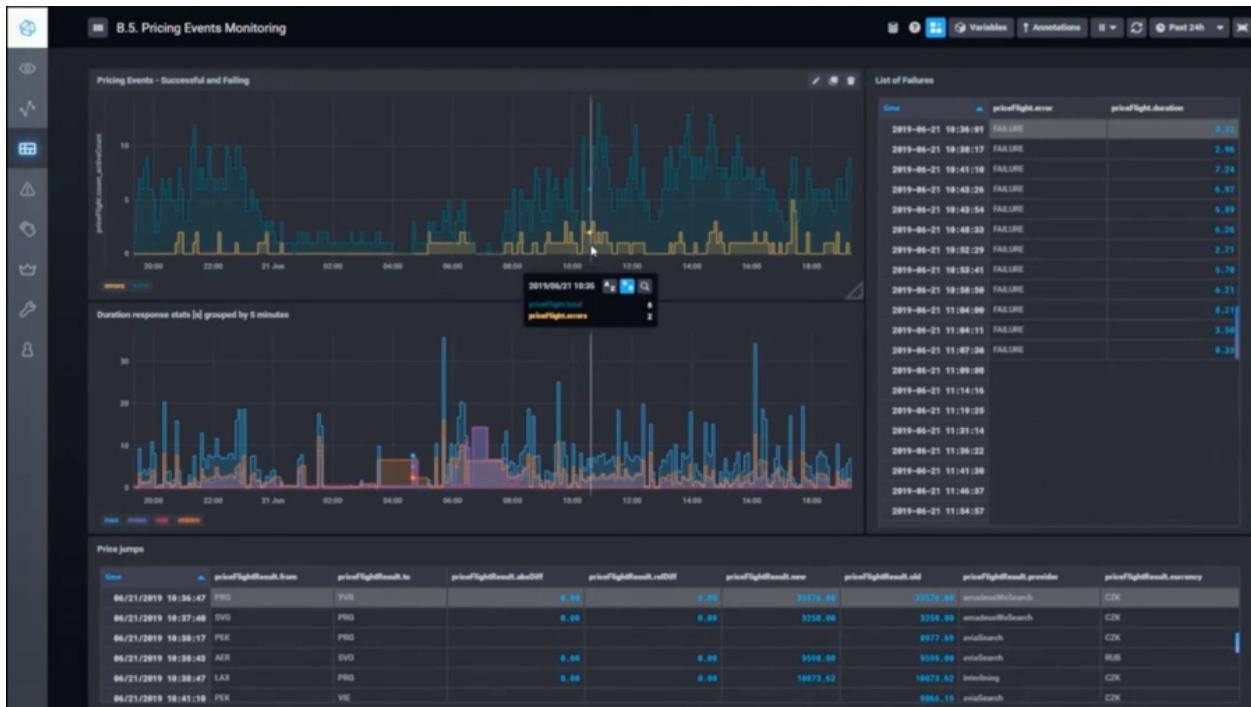
Using InfluxDB as its time series database, Web Shop Fly built its solution on real-time data insights, seamless connectivity, and cost efficiency by using:

- Business monitoring (focus on the right flights)
- Smart integrations (optimize API calls cost)
- Caches
- Application performance monitoring

What are they able to achieve with InfluxDB?

Let's take a look at some of the specific metrics that they are collecting and using to understand how the service is performing. In this instance, they are trying to determine how well the search requests are performing for the end users. In the below graph, the blue lines represent the number of requests for a particular search request which includes the flight details (airports, airline, time/date) and the price. The yellow lines are the corresponding error codes that they get from the airline or OTA systems. The graph below shows the response time of the searches separated by the max, mean, and min of the response times. You can see how these metrics help them fulfil their 7 second SLA for search by letting them know which search result was problematic and why.

Monitor Pricing Results



They also monitor and visualize the accuracy of flight pricing over time.

Pricing Accuracy Monitoring



They are also able to gather metrics that help them understand the user adoption of the service and how well bookings/orders are progressing. For adoption, they have a feature that allows a user to be emailed for the “best” prices, so they monitor for number of registrations per day and overall adoption over time as well as the number of emails sent.

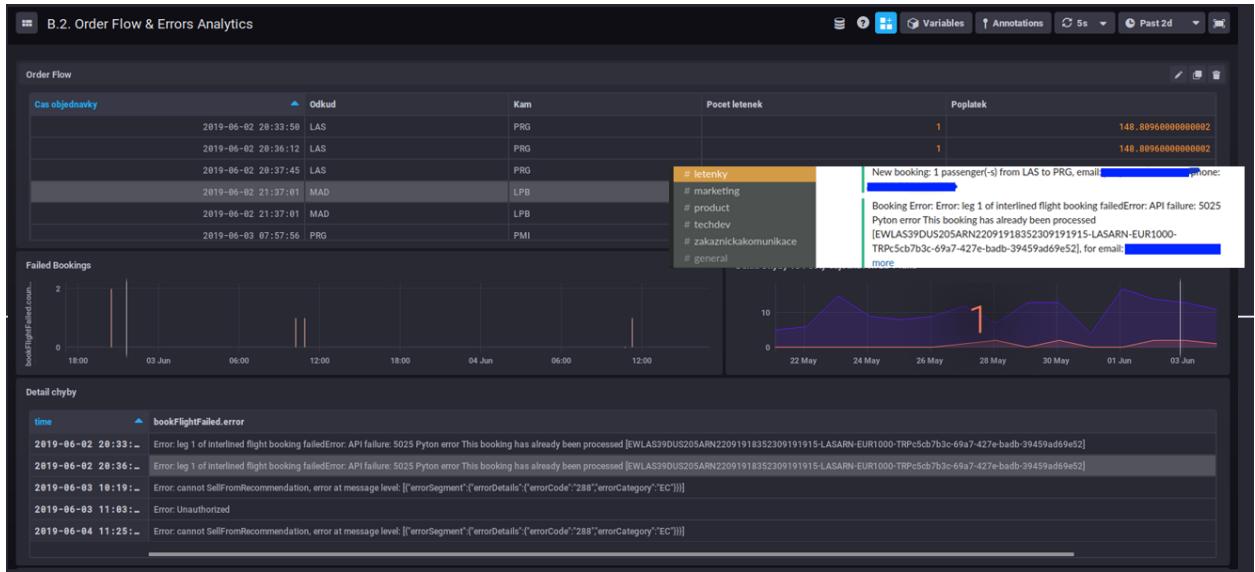
They have a flight watchdog monitoring dashboard that shows the list of notification emails sent to customers who have already registered to be notified about flight price changes. The dashboard below shows the number and duration of registrations over time.

Flight Watchdog Monitoring



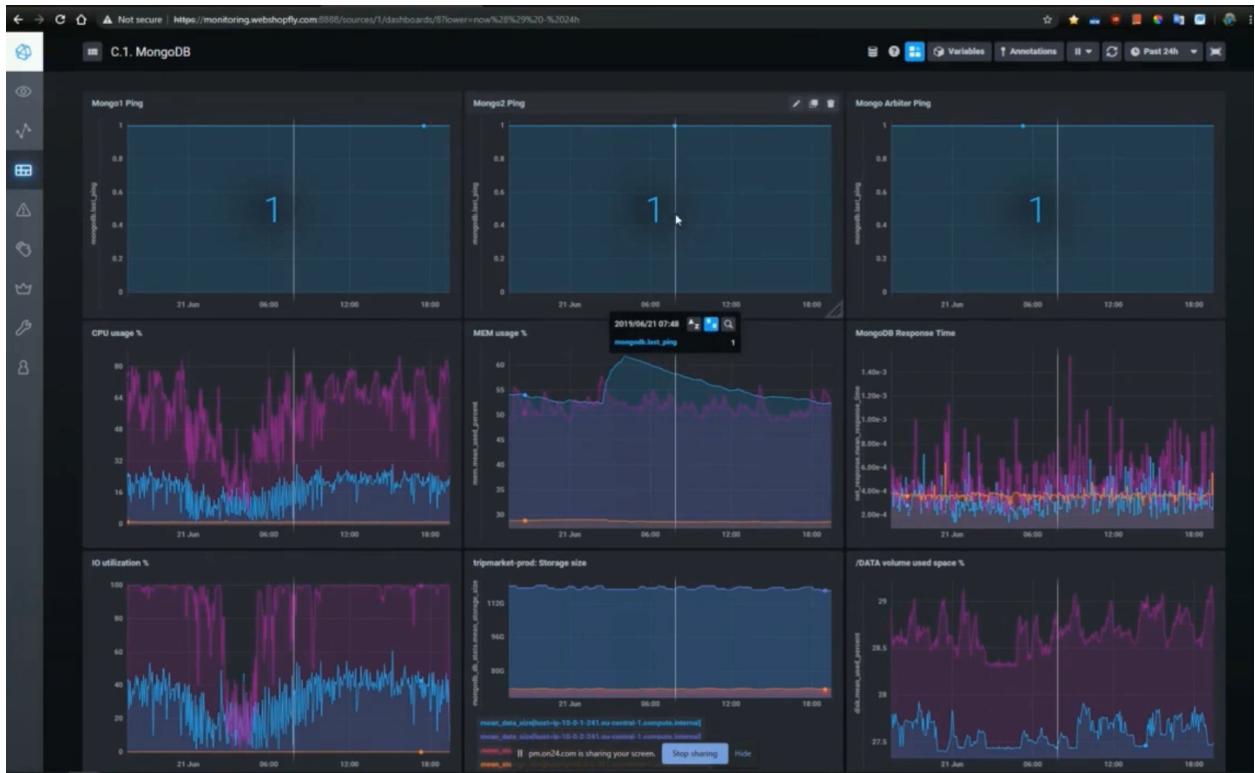
As for the bookings (order) performance, they look at the number of bookings coming in, how many failed orders they have compared to the error codes generated to determine which system is at fault (airline, OTA system, etc).

Orders vs. Error Events Correlation



For infrastructure monitoring, they monitor the database and use custom connectors that provide information regarding database availability. The numeral “1”, in the dashboard shown below, means the system is available while zero means the system is not available. So they extended that approach to be able to understand whether the system is working well or not.

Infrastructure Monitoring

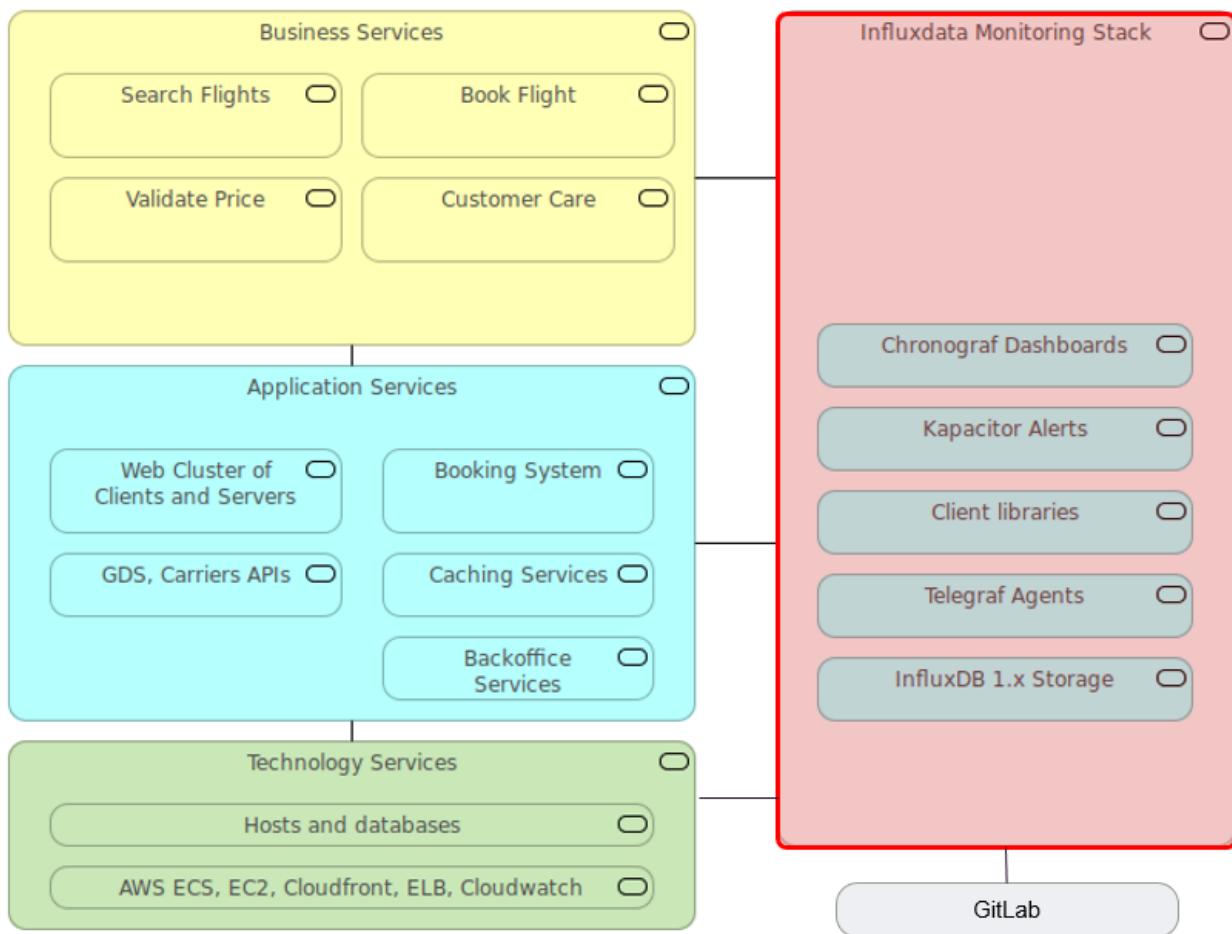


When they combine this view of their business with the typical infrastructure monitoring they also do, they have a good sense of where problems occur and how to address them quickly to keep the bookings coming.

Technical architecture

"The full InfluxDB stack is very suitable and very easy to integrate and implement and get the right views to get the right insights and to make the right decisions based on the information that we are getting from it."

Web Shop Fly Architecture Using the InfluxData Monitoring Stack



Above is a high-level diagram of Web Shop Fly architecture, which consists of containerized services and a MongoDB cluster on AWS, as well as InfluxDB stack.

The left side shows the business, application and technology services provided by Web Shop Fly. All these services are linked together, and all these layers are connected with the InfluxData stack.

Monitoring components within Web Shop Fly's architecture include:

- Telegraf Out of the box (OOTB) Plugins – for infrastructure metrics
- Telegraf Exec Plugin with custom shell script – for some custom metrics
- InfluxDB JS and Java Client to capture information from their application
- Kapacitor for anomaly detection and alerting
- Chronograf dashboards
- InfluxDB to store all the metrics

The whole stack is integrated with GitLab for authentication of the users that connect to the system.

Web Shop Fly uses Telegraf plugins to capture metrics about the performance of their infrastructure. They also use the InfluxDB JS and Java client to capture information from their application that informs them about the performance of their application as well as providing them with business metrics. The following shows an example of how easily they can add metadata (or tags) to the events they are capturing and inserting into InfluxDB.

Example of JavaScript Code Being Generated for Insertion into InfluxDB

Application Event Code (JS)

Pricing Event

```
const tags = {
  type: auditEvent.type,
  from: originIataCode,
  to: destinationIataCode,
  ow: '' + auditEvent.oneWay
};
const props = {
  adt: auditEvent.adults,
  chd: auditEvent.children,
  inf: auditEvent.infants,
  success: auditEvent.success,
  duration: auditEvent.duration
};
if (auditEvent.input) {
  tags['currency'] = auditEvent.input.currency;
  props['oldPrice'] = auditEvent.input.price;
}
if (auditEvent.output) props['newPrice'] = auditEvent.output.price;
this.analytics.event('priceFlightResult', client.user, engine ? engine.getName() : null, tags, props);
```

Analytics class

```
this.connection = new InfluxDB.Connection({
  hostUrl: Meteor.settings.private.influxdb.url,
  database: Meteor.settings.private.influxdb.db,
  retentionPolicy: 'monitoring'
});

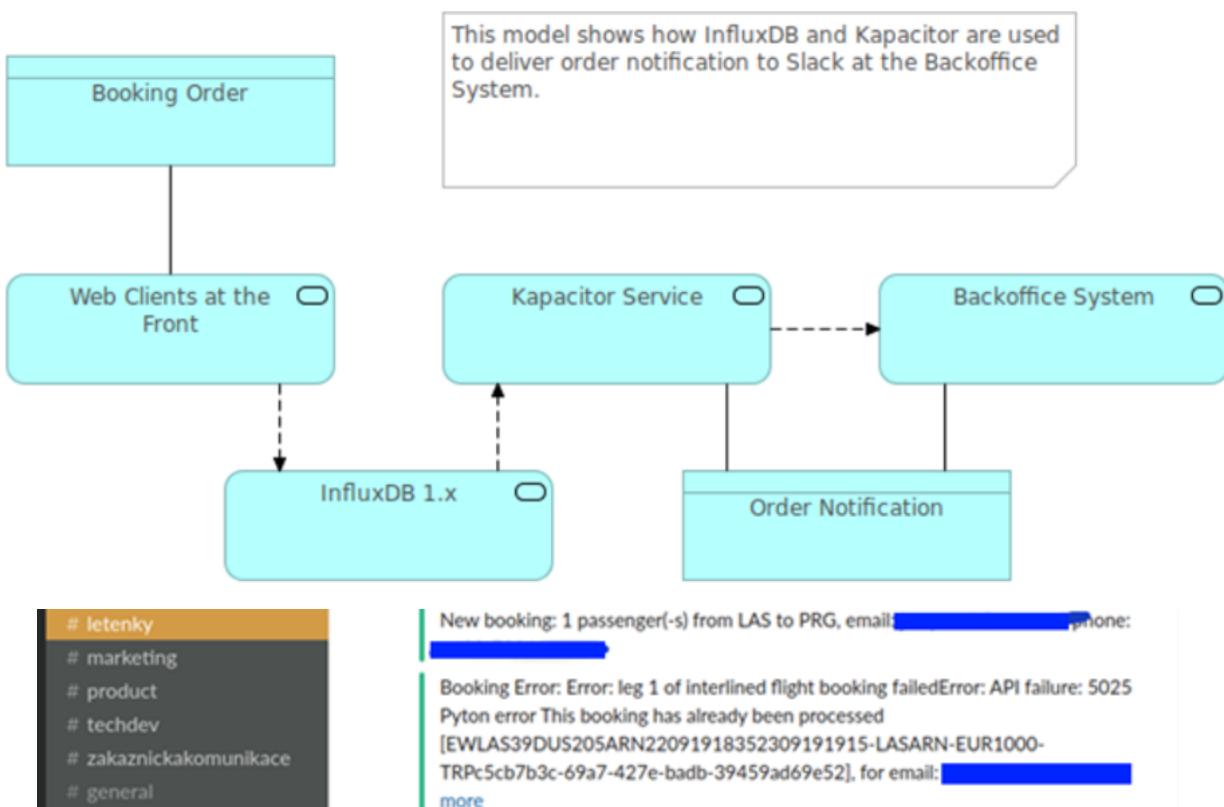
this.connection.write(dataPoint).catch(console.error);
```

The above example of Web Shop Fly's JavaScript code shows how they generate the events into InfluxDB. They prepare the message, add some additional information they want to have in the monitoring, and then send the event into an analytics class that is responsible for all events. They also extrapolate some key commands from the analytics class with the connection to InfluxDB. Then, once the event is created and properly formatted, it's written into the database. This is how they capture, events from various sides of the application, into InfluxDB where they can generate the metrics.

Since all metrics and events are stored in InfluxDB, it is easy to link the various metrics and provide a single view across application, business, and infrastructure metrics. Even though their application has some unique functionality to support their use case, they were able to get the solution up and running quickly.

They use Kapacitor for alerting. Shown here is the booking order process done through the web interface.

From Order to Notification Alerting



When customers create a new order, the event is pushed into InfluxDB. It is then processed by Kapacitor service that uses the order notification structure to push it into Web Shop Fly's back-office system. The back-office system also includes Slack, where the back-office team get additional information about the new bookings, or some booking error in case something goes wrong. So they also use InfluxDB as a source of the events for alerting into the back-office system.

Results

"It's very helpful to be able to capture the information and get the context about the orders and about errors which are coming from completely different systems."

Web Shop Fly's use case provides a realistic example of how the decision to become data-driven and implement real-time monitoring can transform market positioning and competitive advantage, and turn challenges into untapped opportunities.

Apart from having a clear goal from the onset, they also selected the right toolset to reach that goal. With one platform, Bonitoo could manage all the data that they needed in order to achieve Web Shop Fly's competitive edge. InfluxDB stack gave Web Shop Fly real-time visibility into their systems.

By improving flight search and purchase experience, they met their operational and customer experience goals. Their performance monitoring application gave them the competitive edge they needed to differentiate themselves and ensured their value is visible.

Today, Web Shop Fly is one of the most important travel agencies in the Czech and international markets thanks to:

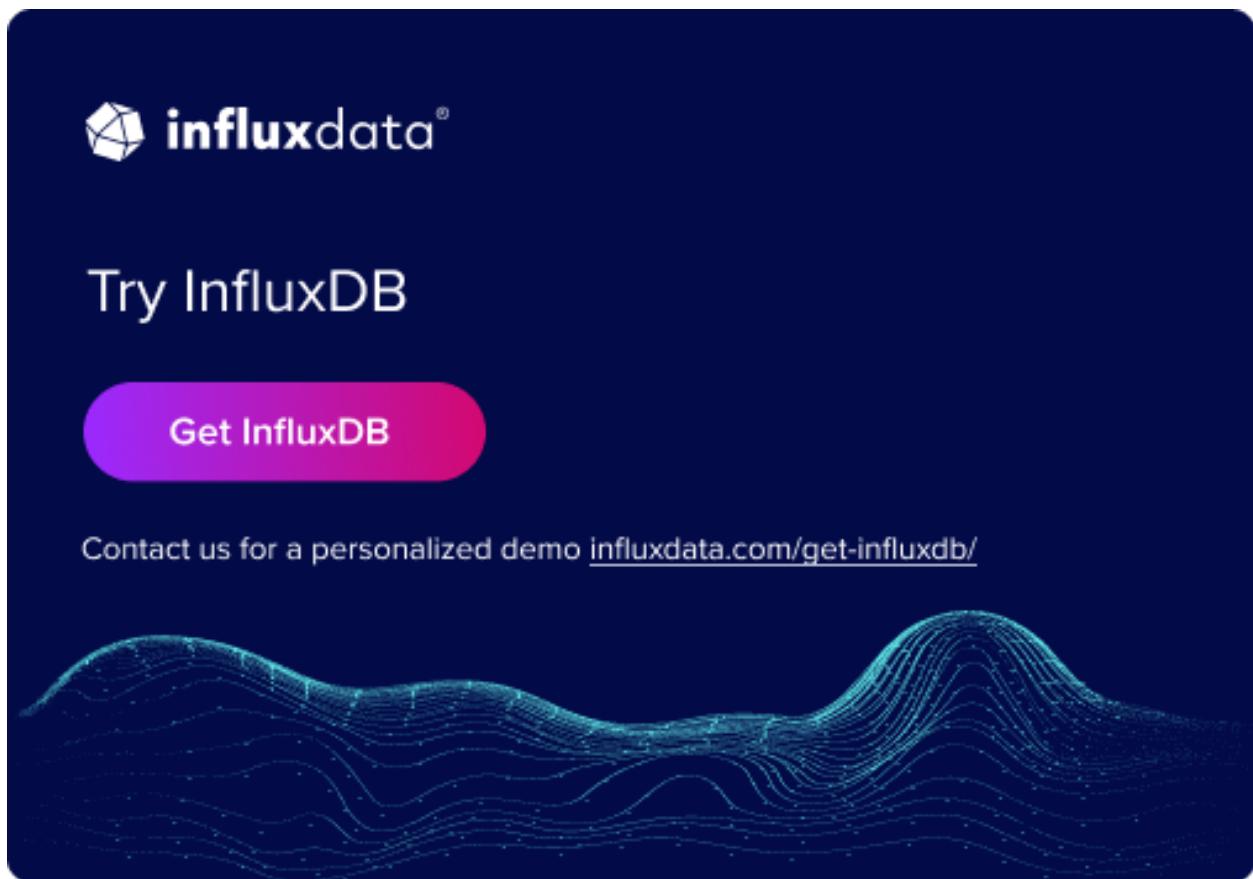
- Product and technological innovation
- Providing a comprehensive range of solutions and services
- A quality that is prioritized over quantity
- Strengthening long-term relationships with customers and business partners
- Offering a broad portfolio of customized services and solutions

Using the InfluxDB stack, Web Shop Fly has fulfilled its vision of becoming a modern, customer-oriented, prosperous and evolving company.

About InfluxData

InfluxData is the creator of InfluxDB, the leading time series platform. We empower developers and organizations, such as Cisco, IBM, Lego, Siemens, and Tesla, to build transformative IoT, analytics and monitoring applications. Our technology is purpose-built to handle the massive volumes of

time-stamped data produced by sensors, applications and computer infrastructure. Easy to start and scale, InfluxDB gives developers time to focus on the features and functionalities that give their apps a competitive edge. InfluxData is headquartered in San Francisco, with a workforce distributed throughout the U.S. and across Europe. For more information, visit influxdata.com and follow us [@InfluxDB](#).



548 Market St. PMB 77953, San Francisco, CA 94104