



# How tado° uses InfluxData to make any air conditioner smart.

AN INFLUXDATA CASE STUDY

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# Overview

With the number of smart homes set to reach 500-700 million globally by 2020, demand is rising for smart home technologies to reduce energy usage and cost. That's why tado° uses the intelligence and power of the web for its Smart Thermostat and AC Control unit to prevent energy waste while delivering the highest level of comfort. tado° uses InfluxCloud to gather analytics data collected from its hundreds of thousands of units across the globe, and uses this data to power their smartphone apps which helps their customers understand their energy usage and determine their ideal setting.

The result: tado° Smart AC Control device, as well as its web and mobile app, makes any air conditioner smart by making it controllable from anywhere. It provides an intelligent solution to automate temperature control using a variety of collected data (geo-location of the user, temperature, user settings, current device functional state) and lets users know when the device may need maintenance. InfluxCloud serves as Smart AC Control's secure and hosted scalable Time Series Database to collect data and serve it to their mobile app through its simple-to-use query language, InfluxQL.



## About tado°

tado° GmbH was founded in 2011 in Munich, Germany as a company focused on home climate control. Driven by its mission of smart energy management without sacrificing comfort, tado° believes it is possible to live comfortably and still act responsibly. Since 2012, tado° has been connecting heating systems with the internet and making their control even smarter. In June 2015, tado° augmented its service with a Smart AC Control that enables consumers to intelligently control air conditioners.

tado° is constantly evolving to incorporate the latest trends in smart home technology and today sells its devices worldwide. tado° GmbH Head of Server Development Michal Knizek and member of the technical staff Florian Rampp led the architecture design behind the company's heating and cooling control products.

*“InfluxDB has been a great for our environment because it seemed to be built for our specific use case.”*

*Michal Knizek, Head of Server Development*

## The Business Problem

The company wanted to benefit from IoT – even as early as its inception in 2011 when IoT best-practices were not yet clearly established – to develop genuinely intelligent automated controls and customizations to daily routines and personal preferences. Common IoT challenges also had to be overcome, such as collecting, storing, and analyzing metrics and events (time series data) from heaters, radiators, and air conditioners in order to provide user-friendly automation and significantly reduce energy costs by up to 31%.

As tado°’s customer base grew, its products and architecture needed to evolve. Recognizing the importance of engaging customers with daily reports to demonstrate measurable cost and energy savings, tado° also needed the ability to respond to customers change in habit in real time. To support this, tado° needed to collect more data to regulate the heating and air conditioning systems automatically without any action on the part of their users.

## The Technical Problem

Finding a scalable purpose-built Time Series Database was a key challenge for tado°, as it needed a solution that would support its specific use case and accommodate its growth. To get started quickly, tado° created a simple custom solution using a single MySQL table to capture time series data from their 500 customers. Soon 500 customers grew to 5,000, requiring tado° to adapt this solution with a separate MySQL instance as well as separating out the individual time series types (e.g. all devices’ inside temperature) into a single MySQL table. But once their customer base grew to 100,000 this solution could no longer handle the load, which led to an online search where tado° discovered InfluxDB 1.0.

Further, tado°’s customer temperature graph (user report) in their mobile apps, which was originally powered by MySQL, had become very slow and lacked features like collecting and displaying humidity and weather data. They wanted to achieve a 99% response time of 500ms as well as retain data for 12 months to provide customers with a full year’s view of device performance. With these requirements in mind, they load-tested InfluxDB 1.0. After a bumpy start due to performance problems with LAST() queries resulting in slow user report response time, tado° upgraded to InfluxDB 1.1 which surprisingly sped up queries by 200 times.

*“While testing other solutions, we tried our current production loads against InfluxDB and found that it exceeds our needs.”*

*Michal Knizek, Head of Server Development*

## The Solution

In tado°’s use case, InfluxDB serves as the Time Series Data Store to store and analyze metrics from their devices.

The data trail from tado° device to InfluxDB



- Using the 6LoWPAN low-energy protocol, tado° devices communicate wirelessly with the company’s Internet bridge which is connected to the home router.
- Devices report temperature changes to the server of 0.1 degrees or more. This measurement is wrapped in a message and sent through a secure WebSocket to tado°’s cloud infrastructure which consists of EC2 instances at Amazon Web Services; from there, tado° writes the data collected to its InfluxDB Time Series Data Store.
- One example of how they use the data collected is with the user report in their mobile apps. This report provides the user with a view of when the residents are at home or away and their home temperature over a 24-hour period. The combination of this data helps the user see how the app automatically adjusts the temperature based on the user’s proximity to their home.
- Writing to InfluxDB is done through a hosted instance in InfluxCloud, and there are 5-10

application instances writing in parallel at a total write rate of 5000 points/s. Batch writing is used, and write time for batches is observed.

- Netflix Hystrix adds resilience and fault tolerance, providing backup if batch write requests fail.

*“Customers realize that the new user report generated with InfluxDB is cool and very fast, so they will use it more. With this increase in use, we expect higher data loads that we know InfluxDB can handle.”*

*Florian Rampp, member of the technical team*

## Results

InfluxDB has solved tado°’s scalability and user report response time problem, enabling it to pursue further growth and provide customers with instant access to daily insights and a full year’s view of their home temperature. Unprecedented convenience and efficiency are now only a click or swipe away:

- Easy setup: Smart AC Control connects to the home Wi-Fi – no additional device or wiring is needed.
- Location based on/off: Using residents’ location, the AC self-regulates automatically to detect the first person returning, cools before they get home, and saves when residents are away.
- Control from anywhere: The tado° mobile app allows users to check and change settings remotely while on the move.
- Save money: Users can save up to 40% on AC costs, and tado° can pay for itself in less than a year.
- Works with almost all remote-controlled ACs: Smart AC Control device controls the AC via infrared.
- Multi-zone control: Multiple ACs at home can be controlled within one app.
- Reports: At-a-glance user reports offer quick access to recorded temperatures, humidity and more.
- Tailored automation: Smart AC Control can integrate with other services such as IFTTT (If This Then That, [www.ifttt.com](http://www.ifttt.com)), Amazon Echo for voice-control commands (US only), and other platforms.

tado° also plans to start adding some streaming analysis with Kapacitor, triggering actions when the inside temperature rises above a certain temperature threshold. They also plan on using the recently released Chronograf to help them improve their backend graphing to debug customer issues.

With InfluxCloud, tado° is able to offer the proper insights in their application so their customers can now effortlessly integrate energy savings into daily life in an easy and measurable way. At a time when one third of the energy consumed around the world is used for heating or cooling buildings and when the systems used are controlled by non-smart long-outdated technology, tado° is definitely a step forward towards a more energy-efficient world where intelligent home environment automation becomes the norm rather than the exception.