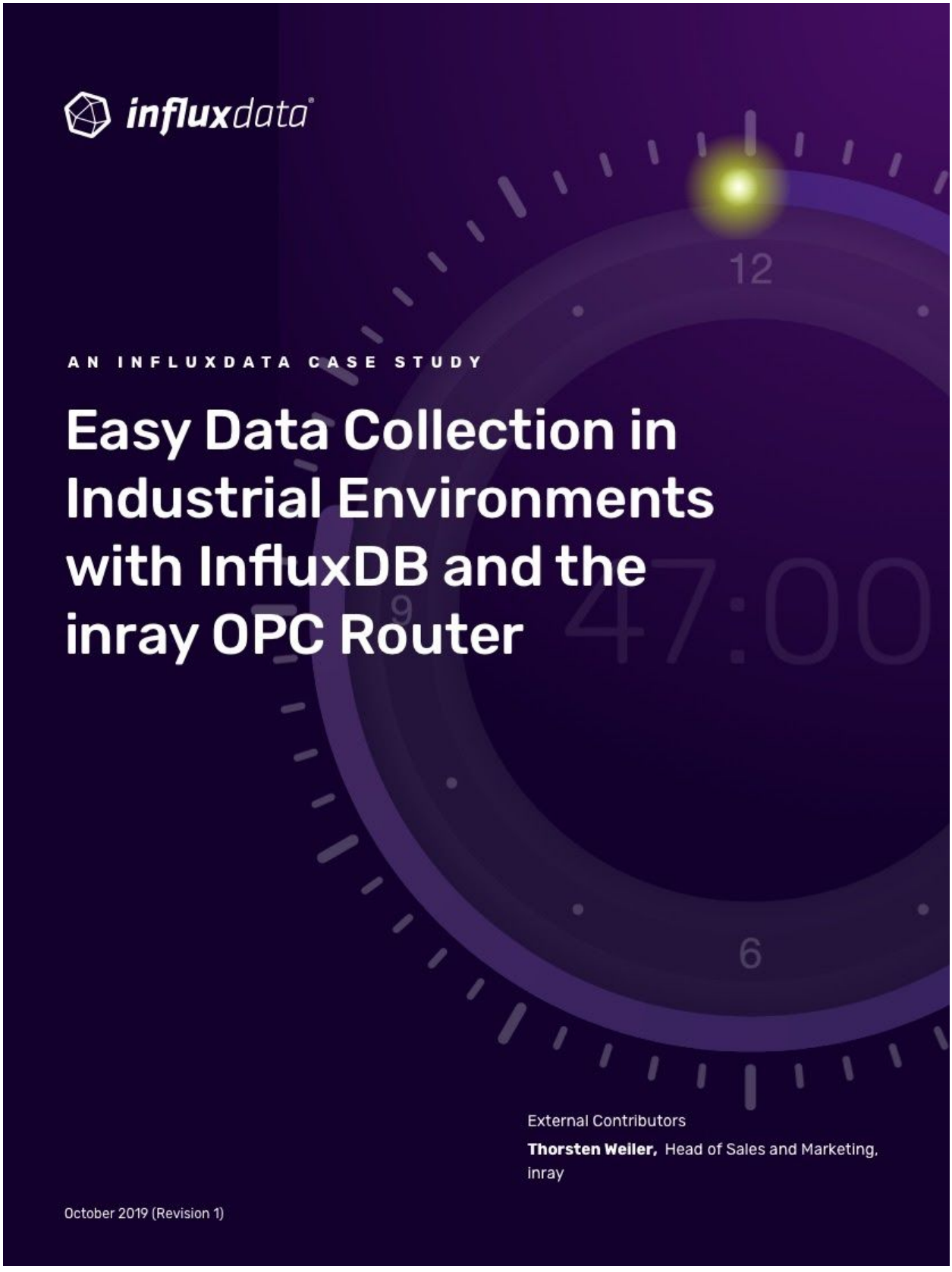

influxdata

AN INFLUXDATA CASE STUDY

Easy Data Collection in Industrial Environments with InfluxDB and the inray OPC Router

External Contributors

Thorsten Weiler, Head of Sales and Marketing, inray

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Company in brief

inray Industriesoftware GmbH is an industrial software company located in northern Germany, over 20 years in the market and with 70 employees. Inray is creating a distribution network for OPC routers, and has some 50 partners in more than 30 countries and several thousand software licenses implemented worldwide.

inray works for manufacturing companies of all industries in the food- and non-food sectors. Thanks to extreme scalability, small manufacturing companies appreciate inray's products and international scope, with its project engineers traveling across Germany and Europe.

inray is a specialist in the industrial sector, providing software solutions that enhance MES/SCADA, LIMS, and MDE/BDE-systems. inray's speciality is the segment of data communication between software systems and components, in the fields of Industry 4.0, IoT and IIoT. On the basis of its own software products, inray plans clients' application to measure. In addition, inray offers consulting, implementation and training services in order to help their customers achieve the measurable results that they expect from their equipment.

Case overview

Big Data projects and extensive data collection build the foundation to achieve today's challenge of making businesses more efficient and effective. To understand the potential of optimizing industrial and commercial processes, there is a need to gather available data from different data sources to analyze, understand and optimize your business. To connect the various data sources through a central platform and enable seamless bidirectional communication, inray created OPC Router software.

Using OPC Router, inray provides an easy way to connect InfluxDB with almost any industrial and commercial system. OPC Router collects time series data — using the OPC protocol — from PLCs, sensors, and controllers and stores this data into InfluxDB. OPC Router is able to interface with commercial systems like ERPs, MES, and cloud systems to help automatically link data together in a meaningful way for inray's customers.

The data collected through OPC Router can be used for data transfer, analysis, reports, and executing powerful workflows to increase efficiency and quality while lowering production costs. For its Industry 4.0 clients, and via standard interfaces, inray connects existing systems without programming effort and guarantees continuous, immediate availability of data and evaluations.

> *“There's the need to connect different kinds of systems today. This is where InfluxDB as a component fits in very well.”*
>
> ***Thorsten Weiler**, Head of Sales and Marketing, inray*

The business problem

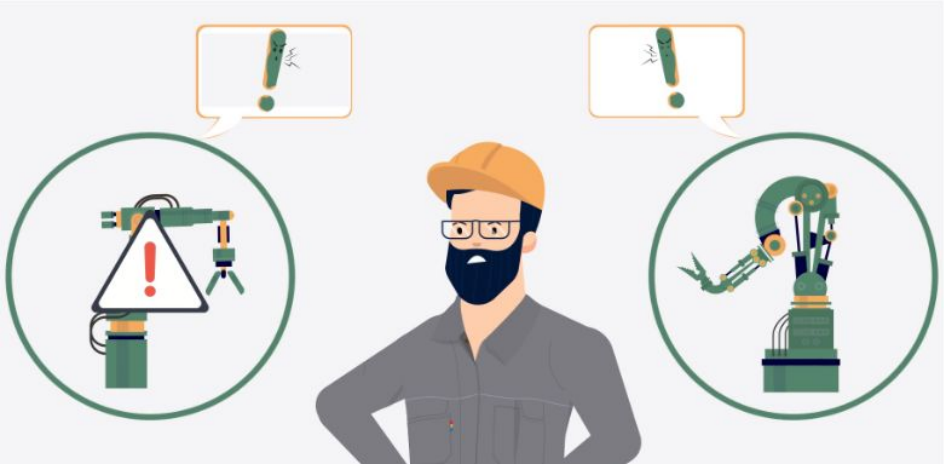
inray customers are well-known production companies in the manufacturing and process industry. inray wanted to provide its customers with optimal software for solving their optimization needs, in a way that customers themselves can independently support and expand the implemented application.

For industrial customers, continuous optimization of production processes is crucial for product quality and ultimately for business success. Optimization requires collecting data, which creates added value when data can be collected cost-effectively and easily and when the collected data is used to support operational decision-making and business goals. This is especially true since Industry 4.0, IoT, IIoT, and digitalization trends have led to more automated systems and production processes as well as more intelligent and flexible systems that generate massive volumes of data.

The data generated in these new dynamic environments can be used to cut cost and improve business and process efficiency through numerous applications:

- **Machine learning** — using machine learning software to train models based on historical machine data to achieve more effective and efficient operation
- **Condition-based monitoring** — enabling early detection and diagnosis of machine and system abnormalities in real time (factors such as vibration, current, and temperature provide insights into the health of equipment such as motors, pumps, bearings and encoders)
- **Predictive maintenance** — using data to establish optimal maintenance and inspection routine to avoid unplanned downtime and save money (data can indicate machine temperature rising, machine requiring more power, motor overheating, running over 20,000 hours, etc.)
- **Validated/regulated processes** — enabling companies (especially in the chemicals, pharmaceuticals, and food and beverage industries) to provide the burden of proof for batch or lot IDs, to prove that they were running the machine within the specified and validated area.
- **IoT monitoring** — monitoring machine performance through sensors to alert on downtime or issues, and make real-time data-driven decisions
- **Decision automation processes** — using data to learn how to run a process in order to meet a specific target (such as configuring a system automatically based on existing data to achieve the day's target energy savings or target maximum output)
- **Cost reduction** — using collected data to build intelligent systems that reduce cost
- **Increase of quality** — improving product quality based on operational data insights
- **More customer service** — providing customers with more information about the production process

Yet the challenge in collecting data from various sources in a factory environment is to connect and set up data exchange between different types of automation systems and devices that often speak different languages.



Enabling systems and devices to communicate cuts time and cost

The technical problem

inray set out to build a central communication platform, based on OPC Unified Architecture (OPC UA) protocol, for industrial projects: OPC Router. It is a friendly software tool that lets different automation systems communicate, simply by connecting via drag-and-drop using the implemented plugins. As OPC client software, OPC Router directly supports the construction of the Internet of Things (IoT) and Industry 4.0 communication.

To better understand how OPC Router communicates with various systems and what technical problem InfluxDB solved for inray, below is an overview of OPC UA protocol followed by a discussion of the added value of using InfluxDB with OPC Router.

OPC UA – the communication standard of industry 4.0

Developed by the OPC Foundation, OPC UA is an important communication protocol for Industry 4.0 — a platform-independent option for communication between different devices. As a machine-to-machine protocol for industrial automation, it is used on all automation levels and enables connection between a variety of systems. OPC UA is open, cross-platform, and focused on communicating with industrial equipment and systems for data collection and control.

Building the OPC Router central platform to modernize production

As a central communication platform, OPC Router offers automated data exchange by integrating all systems and isolated solutions. By using OPC Router, industrial customers can supersede old communication pathways step-by-step — up to complete integration of PLC (programmable logic controller), PCS (process control system), SCADA, SQL-server, label printers, email-server and ERP (Enterprise Resource Planning) systems — and thereby modernize production.

- OPC Router is based on standard interfaces for data exchange across all automation levels
- The recording of process values, production figures, downtimes and consumption provide the basis for optimizing production
- Connectivity between automated systems is event-driven
- Individual connections and transfers are created via user-friendly graphical configuration
- Latest middleware for your IoT and Industry 4.0 projects
- Various connection types are implemented via plugins

Creating connection opportunities with OPC Router

The OPC Router operates as OPC client software for OPC DA and OPC UA:

- With the OPC plugin, you can read and write data points from OPC servers, ideal for industrial data acquisition from any PLC or other device.
- OPC Router can serve as a data logger machine-to-machine gateway, IoT-driver or gateway between PLC and other systems, such as ERP, database or e-mail.

Connecting OPC Router to InfluxDB

Plugins are a key component of OPC Router, and it's through plugins that connections between and to the various systems are implemented. As middleware, OPC Router connects databases and different sources. Databases are an important source and target for data at various production levels. Production processes must be provided with ordering information, recipes or machine data. Large amounts of data are generated and must be stored.

Since IoT, monitoring, and alerting data are all time series data, inray needed to connect OPC Router to a scalable, high-performing database designed for time series data. So they developed a plugin for InfluxDB, the purpose-built open source time series database, to ingest data from the OPC Router.

The solution

> *"Our customers are using InfluxDB because it's an open source time series database which can process very high loads of data."*

Why InfluxDB?

inray chose to integrate InfluxDB into OPC Router because InfluxDB met their data processing and exchange needs:

- **Open source time series database designed to handle high write and query loads** — InfluxDB is much faster than the automation solution that inray's customers are using, but with that, inray is making sure that all the data points they want to transfer to the database reach it without any data point loss.
- **Can be used as cloud service** (no need for separate server hardware and no administration costs) — in the operational technology (OT) and automation sectors, where companies often don't have specialized IT skills or an IT department to set up database systems, InfluxDB is easy and cost-effective to use because it is available as a managed, cloud-based, database-as-a-service (InfluxDB Cloud).

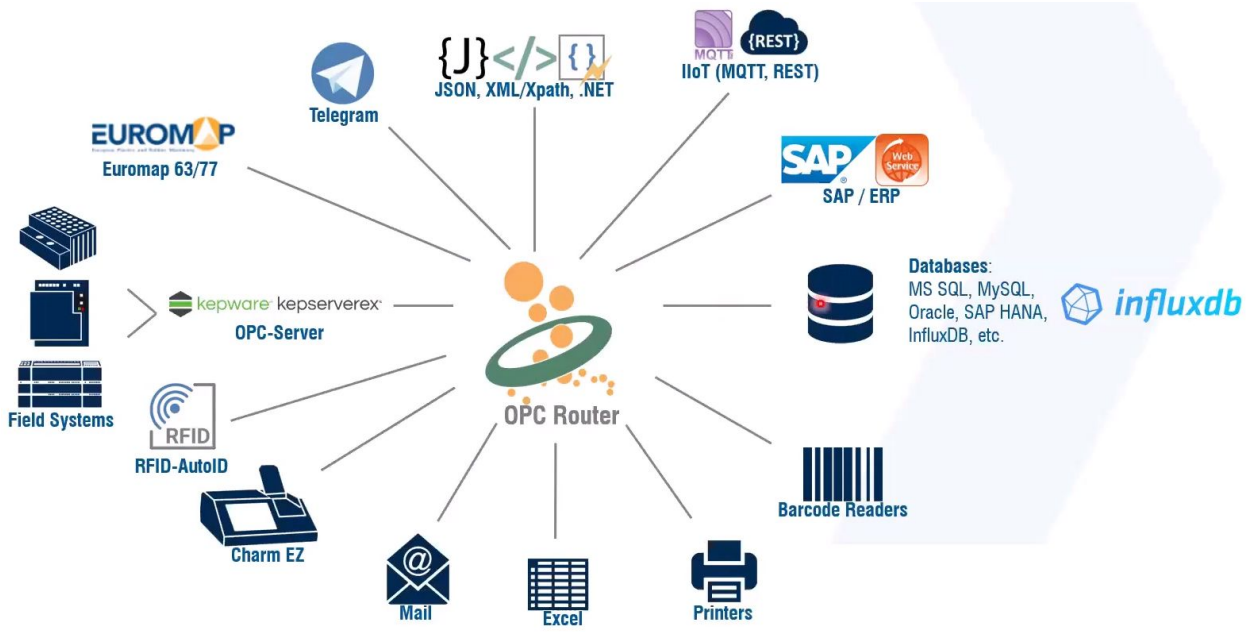
- **Easily integrates with many tools for data analysis and visualization** (Chronograf and Grafana for visualization, Telegraf for metrics collection; and native query languages InfluxQL and Flux) — this ease of integration enables customers to perform queries to learn about the data and about how to use it and to set different data points in context with each other.

How OPC Router works

OPC Router connects OT and IT systems through its powerful communication plugins, from Shop Floor to Top Floor.

- **Automated data exchange between PLCs, databases, MES, SAP, printers, clouds, etc.**: For example, OPC Router can exchange data between a PLC or a database and send it to SAP, and then extract data back from SAP and send it to a printer. Then, in case of an error message from a printer, OPC Router can send that information via email or a Telegram message to the maintenance team.
- **Time and/or event-based triggered data transfer:** Data transfer can be every three seconds, on value change, or if a critical value has been reached.
- **No limits on number of users, tags, transfers, or systems:** The system supports as many users, variables, tags, and transfers as you like.
- **Easy drag-and-drop graphical configuration:** No need to have automation skills, to know how to script, or to be an IT expert — just create your connections via drag-and-drop.
- **Modular license structure for additional plugins:** Customers that only want to transfer data from an OPC data source like a PLC to InfluxDB only need these two plugins and can add additional licenses as needed.

The below graphic shows the OPC Router at the center, connecting various types of systems.



OPC Router works like a universal coordinator, enabling systems and protocols to communicate

Value of using OPC Router with InfluxDB

The real value of OPC Router and InfluxDB is in the combination of both products, which allows you to:

- Send data from all your different data sources into InfluxDB.
- Feed a lot of data with the same timestamp into InfluxDB, and have one standardized solution — no need for scripting or creating individual interfaces which nobody wants to maintain
- Set up and use with extreme ease
- Drive cost savings — very affordable pricing for the connection between an OPC data source and InfluxDB.

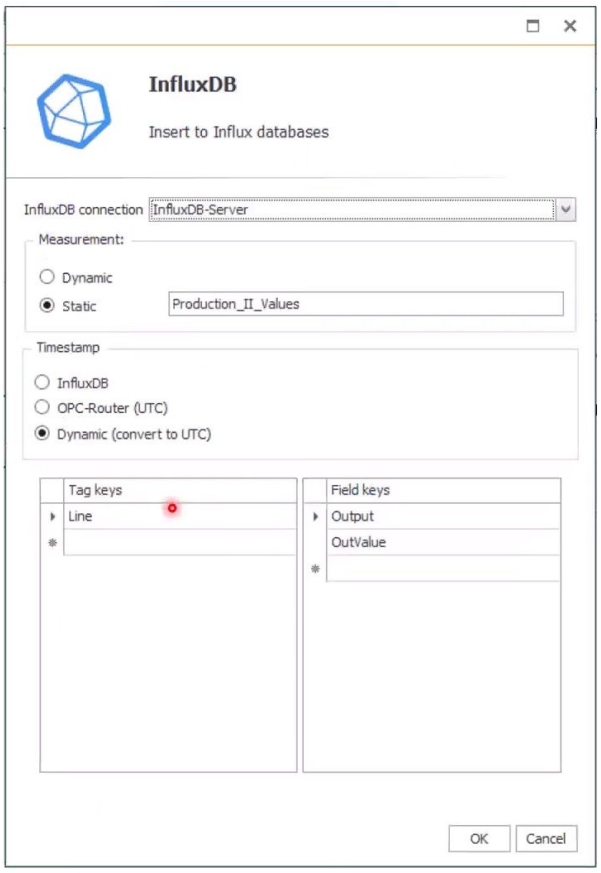
Here is an example of how OPC Router can be used with InfluxDB in a factory setting:

- There could be data coming from a field system such as a sensor, PLC, or OPC server. Data is received via OPC and can be sent directly to InfluxDB with a timestamp, perhaps with other data from other systems.
- At the same time, you can communicate with SAP and get a production order out of SAP and send a production order to a PLC.
- The PLC then attempts to connect to a printer and to start printing labels for the product that needs to be produced, but if the printer is down or faces an issue, it could send out an email or

a Telegram message to a maintenance person who can answer that message and help reset the system.

How to configure InfluxDB through the OPC Router UI

The OPC Router user can define the InfluxDB measurements, tags[1], and fields individually. There's only one interface where this data can be configured. The 'field keys' will get the data.



In InfluxDB, you can define what the tags are by setting descriptors about the data and where it originates from, so you can run reports on it. The OPC Router UI makes it very easy to add such 'tag keys'. They all get fed into InfluxDB, and you can build reports with this information.

- When you run reports on these values, you may want to be able to group them in certain categories. For example, you might want to tag all the units in the factory floor that are on the east side of the building as "east", and then build a report that shows the temperatures of all units on the east versus those on the west (because you suspect that there might be an air conditioning problem on one side of the building).

[1] Note: InfluxDB uses the term "tags" to denote the meta data that you can use to group your data by

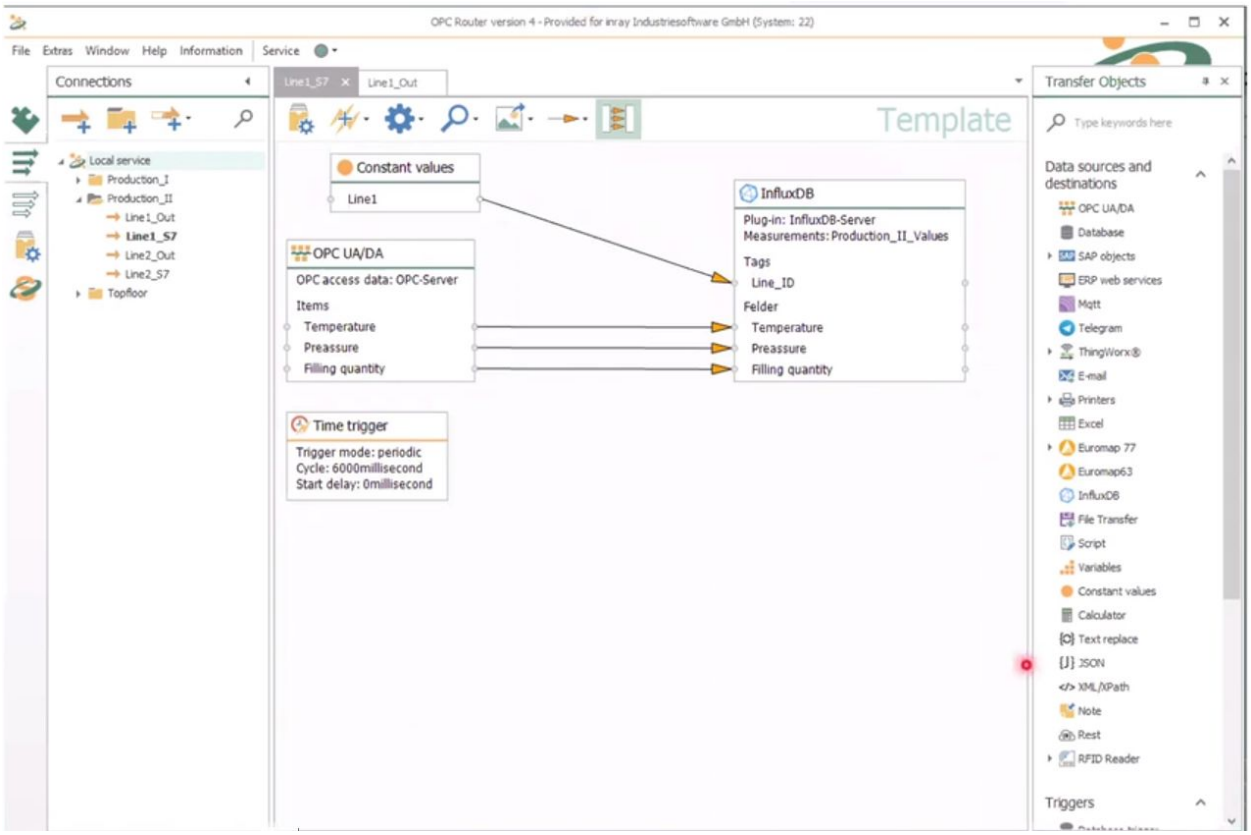
- Another typical use case of InfluxDB tags can be a special production line, on which you want to track all data during the production of a product, to understand how your machine is working and if there are some dependencies between special values like temperature and pressure.

After you define the measurements, tags, and fields, you can create your connections.

Creating connections

Developing connections in the OPC Router UI is easy, done via drag-and-drop, as shown below:

- On the left-hand side is the type of data that you can grab via OPC Router (such as a temperature value that you're measuring over the value of time) and send to InfluxDB because it is a time series database.
- On the right-hand side are the data sources and destinations you can pick.



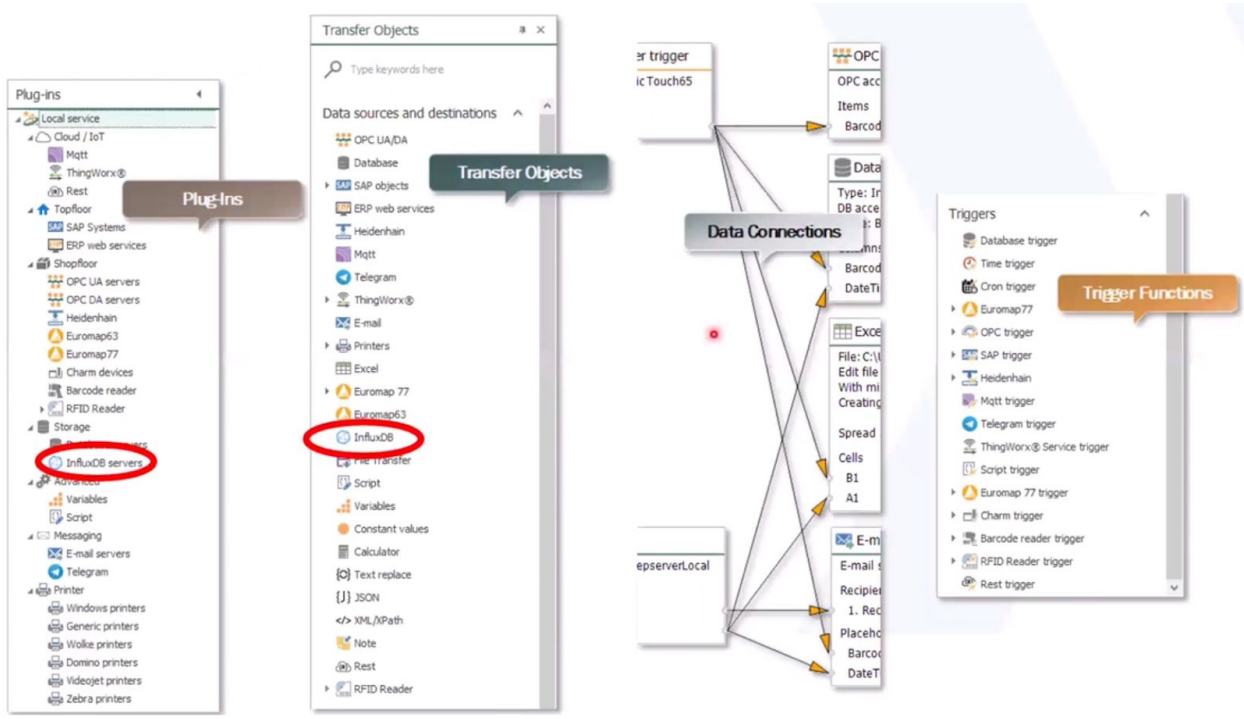
For example, to transfer information (about a production line number and production values like temperature, pressure and filling quantity) to InfluxDB:

- Drag-and-drop the “Constant values” box from the “Database” data source and choose “Line1” as your data point. The same drag-and-drop process applies to the OPC data source.

- You can browse or select the tags of your OPC data source (check the temperature, pressure and filling quantity) and then choose your data target (in this case, InfluxDB).
- You choose your final 'key fields' in InfluxDB where you would like to enter the data.
- Finally, draw an arrow to connect the temperature value with the temperature tag in InfluxDB, to connect the pressure tag of the OPC data source with the pressure tag in InfluxDB, and so on.

Several options need to be configured when creating a connection.

- On the left side of the below screenshot are the plugins (MQTT, ThingWorx, REST protocol, SAP, and InfluxDB). Note below your transfer objects (data sources and destinations).



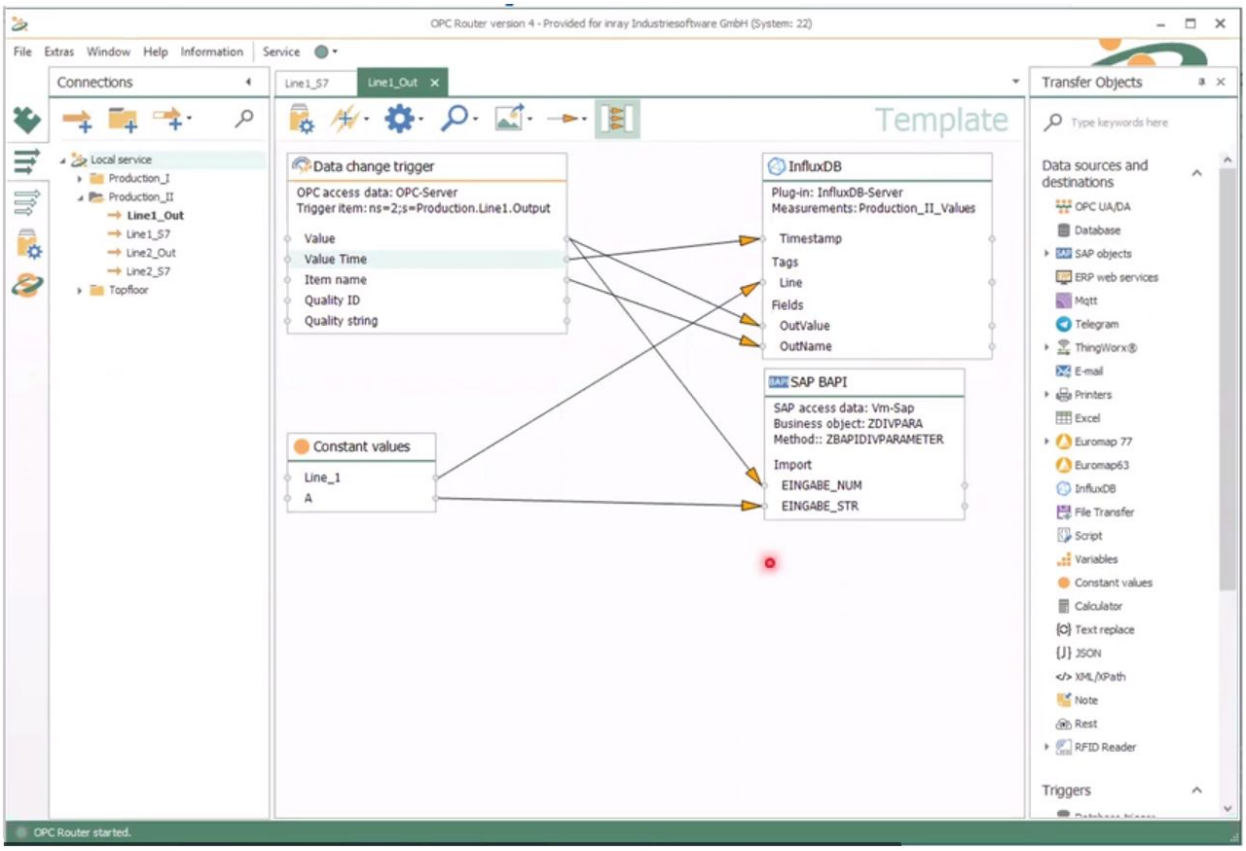
How OPC Router works: plugins, transfer objects, data connections and trigger functions

- Create your data connections by clicking and drawing your arrows.
- Decide when the data transfer to InfluxDB should happen by choosing your trigger function (database trigger, time-based trigger, cron trigger, Euromap trigger if you're working in the plastic molding machine sector, OPC trigger, SAP trigger, and so on).

Using OPC Router in parallel with other systems

Data can also be fed out of your production process from an OPC data source into an ERP like SAP. In parallel, data (the same, different, or additional data points) can be fed into InfluxDB. So you create the

boxes shown below, draw the connections, and the process will run automatically. The data on the left will be transferred to the systems on the right — the two processes run in parallel, at the same time feeding data into InfluxDB and into SAP.



OPC Router feeding data into SAP and InfluxDB simultaneously

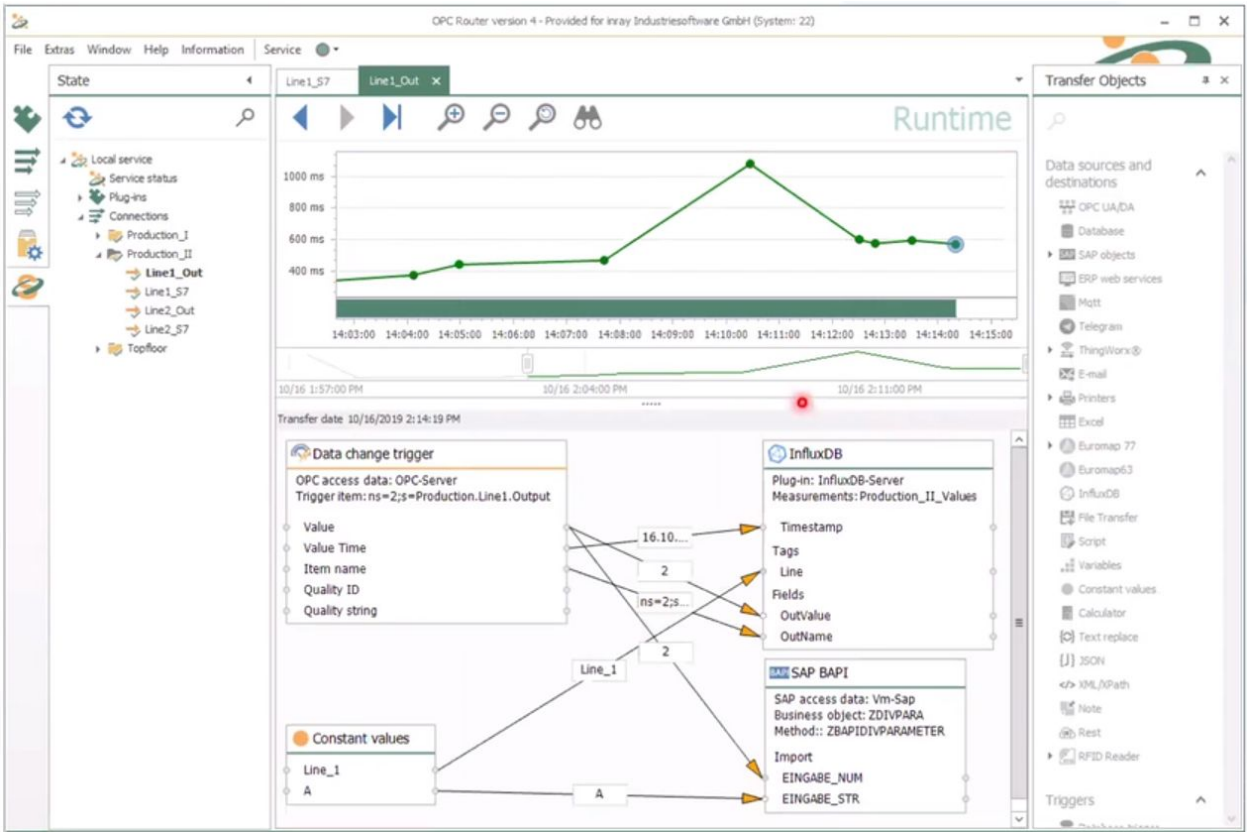
inray supports SAP standards, uses a certified SAP plugin, and supports SAP BAPI, RFC, and IDOC protocols and SAP HANA.

Powerful monitoring

OPC Router makes it possible to monitor your data transfers, providing live diagnosis as follows:

- Live view (visualization) of transmitted data is provided through the friendly UI.
- Data transfers can be controlled live and historically.
- Diagnostic messages from transfer objects are displayed directly on the object.

Below is a sample OPC Router monitoring dashboard.



Real-time monitoring and alerting of your transfers and connections

- The monitoring of the connection is shown at the top. The green dots indicate that the data transfer has happened); when it happened; and how long it took (which can show if the performance is optimal or if it requires process optimization).
- The data transfer process details are shown at the bottom.

If a data transfer fails or an issue arises, the relevant green dots in the graph above will turn red, and when clicked on, show the actual transferred values below the graph so you can locate the issue. For example, if SAP should lose connection, there would be a red frame around SAP and an arrow message to indicate what the issue is and why the connection failed. The OPC Router UI makes it easy to resolve such issues without requiring special expertise. When issues do arise, OPC Router sends automated emails to inform users.

The fully functional free demo at opc-router.com allows you to try OPC Router and use the plugins for InfluxDB, SAP, OPC and others.

Server license without limits

The licenses for inray's products are designed as server licenses. Customers can license only the products and plugins they need, thereby laying the foundation for an expandable communication platform with a calculable investment:

- The licenses for the OPC Router are always valid per server license and include any number of clients, operating pages, data points or connections.
- Only plugins that you would like to apply for your use case have to be licensed.
- Thanks to modular licensing, OPC Router software pays for itself even when using fewer functions.
- Each plugin is licensed separately, and additional plugins can be licensed at any time.
- For special requirements, the OPC router can be designed with a modular format.

Results

> *"It's really that simple to connect different systems with each other and get data out of different data sources into InfluxDB just by clicking and dragging-and-dropping."*

The OPC Router enables you to optimize and digitalize your production processes. Data is automatically exchanged by integrating systems such as OPC UA, SAP, SQL, MQTT, REST, SOAP, Excel, labellers and others. The acquisition of process data provides a continuous overview of your production.

Graphic configuration, exemplary monitoring and extreme reliability mean that the OPC Router paves the way for your Industry 4.0 projects. Easy implementation and administration maximize remote data access while keeping operating costs low. Projects for automation and data exchange can be realized, step-by-step and without programming, to modernize production processes.

OPC Router connects systems vertically and horizontally, from sensors and controls to ERP and the cloud, from printers and scales to MES, SCADA or LIMS. Customers can find the solution for their connectivity project in the multitude of available plugins.

Achieving more with combined systems: Industry 4.0 and InfluxDB

The idea of Industry 4.0 drives networking in industry forward. More components and systems can be connected and queried. For InfluxDB, the OPC Router as the central Industry 4.0 data hub forms the bridge to data of these devices and systems. With InfluxDB plugin, you provide your Big Data

application with even more data from your production environment. Analysis of that data offers even more possibilities to view the entire context.

The benefits of using InfluxDB with OPC Router are compelling: cost savings, reduced downtime as well as improved efficiency, quality and customer satisfaction. Below are some examples of how inray customers are using OPC Router and InfluxDB.

Discovering dependencies

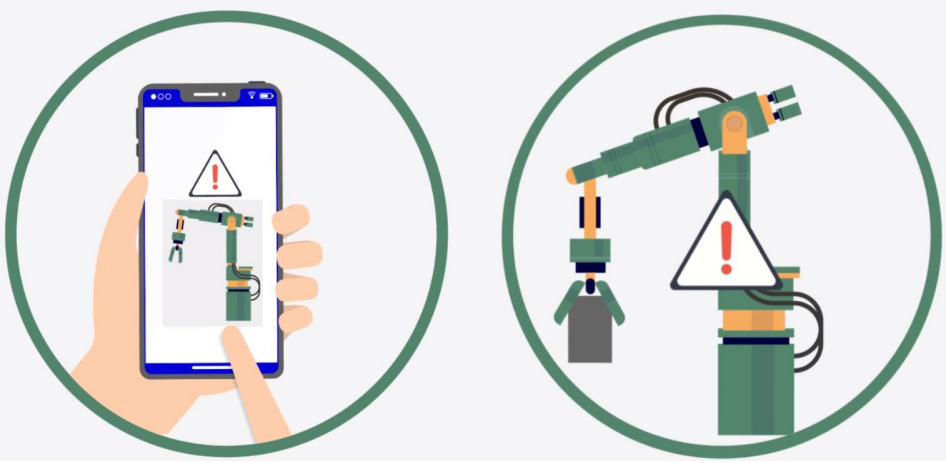
InfluxDB plugin can be used to find out dependencies. Customers collect data from different systems to learn whether these systems and values depend on each other. Understanding dependencies can help optimize operational processes such as conveyor belt speed to save cost and increase output of their production line.

Building pricing and other reports

InfluxDB is an ideal tool for regulated businesses (such as in the food and beverage, chemicals, and pharmaceuticals industries) where production teams need to collect data to build reports. Customers could use the data in InfluxDB to calculate the cost of a special order or to customize pricing for individual customers. Some products may be more expensive to produce than others, and OPC Router users can find out by just collecting data from all of their systems.

Performing predictive modeling

Predictive modeling requires a lot of time series data to forecast what could happen. The more historical data available, the better forecasting models work. InfluxDB can handle really high workloads, enabling you to collect massive data volumes and apply various algorithms. InfluxDB comes with modeling tools like Holt-Winters, which makes it simple to apply that analysis to your historical data to understand potential forecasts and support predictive maintenance.



Using OPC Router and InfluxDB to automate maintenance

Achieving cost savings

Another example is using data to recognize the correlation between different machines and its inherent cost-saving opportunities i. For example, when factories started tracking how much energy was consumed by every single piece of equipment and every single sub-unit attached to each, they could start to optimize energy savings, especially when performing maintenance.

While one machine shuts off for maintenance, it might not occur to factory teams to shut off all other machines connected to it. But when they built reports showing energy consumption across all the different units, they recognized the cost-saving opportunity of shutting down related machines for that maintenance duration.

Optimizing production scheduling

Some inray customers use InfluxDB to optimize their production system scheduling. For example, they produce a chocolate bar with peanuts, followed by a peanut-free product on the production line, so they need to clean the pipes before producing the next product to avoid peanut allergen contamination. Through insights gained from the process data stored in InfluxDB, they realized that they can optimize their production scheduling and cleaning time just by setting the production orders in the right sequence so that the peanut-free product runs first, followed by the peanut bars.

Using OPC Router and InfluxDB to achieve operational simplicity

Providing the 'burden of proof'

By recording production processes through monitoring and documentation, manufacturing companies can also offer that burden of proof. If there were ever a situation where product consumption led to consumer illness, the factory can easily provide proof of processes that they followed to minimize allergen contamination risk. In such a case, the collected data also makes it easier to track which lot IDs and batches could have that issue, and therefore which products to hold back or recall from the market. Data in this case provides legal validation and cost savings for the company.

Time series data insights for continuous improvement

Inray's OPC Router is a perfect example of how an organization was able to integrate InfluxDB into their own products. They built their own UI and a simple way to connect the OPC Router to InfluxDB, all within their own product. The openness of InfluxDB means that you can have your own InfluxDB instance collecting that information and do what you'd like with it.

Even if customers are only sending data between their shop floor and ERP system and a printer and something else, they can add InfluxDB as an additional data storage which can be easily used and fitted with all the data in parallel, to improve processes instead of just keep them running.

The more data we gather, the more curious we get, the more understanding we have, and the more we can set appropriate thresholds. Becoming a data-driven organization helps us extract insight from data, question the folklore that often exists in industrial settings, and use relevant metrics to support operational decision-making.

Integrated into OPC Router as a powerful plugin, InfluxDB is helping inray fulfill its mission of "making production transparent".

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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