

A vertical decorative graphic on the left side of the page. It features a dark blue background with a network of glowing blue lines and nodes. The nodes include various icons: a person silhouette, a smartphone displaying a person icon, and a tablet displaying a person icon. The overall theme is digital connectivity and data flow.

The next 'Big Thing' for your supply chain

Data Loggers vs. IoT Enabled Real-Time Services for Supply Chain Visibility

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Data loggers – Past and Current

Technology is advancing at a fast pace, and operating with the old technologies can hold back a company while innovation outsmarts each passing day. With the accelerating rate of technological change comes the accelerated rate of obsolescence. This is also prevalent in the supply chain industry.

Monitoring conditions such as temperature, humidity, pressure and CO2 emissions as well as theft, vibrations, shocks or tampering is a must in supply chain management. These conditions are particularly important within pharmaceutical, industrial manufacturing, healthcare, food & beverages and the chemical industries.

Traditionally, data loggers were widely used in supply chains to fulfill condition monitoring tasks throughout the supply chain. Data loggers are electronic devices, like a mini-computer, they have a processor, data-storage unit and sensing components built-in. Depending on the deployed sensor, data loggers can be used to log time-based environmental data. The logging in these devices can be automatically triggered after a certain period of time. These devices were once state-of-the art and were considered as exciting and innovative but with the time, much of the old data logging technology has become obsolete and even a restraint to modern businesses.

Conventional data logger devices were once state-of-the art and were considered as exciting and innovative but with the time, much of the old data logging technology has become obsolete.

The usage of data loggers

1 | Configure and launch



2 | Install in the shipment to be monitored



3 | Upon arrival connect to a computer



4 | Analyze manually retrieved data



What are data loggers?

Data loggers are installed in the containers and travel with the cargo. They are electronic devices recording environmental parameters over time. Data loggers are mini computers with a processor, a data storage unit and sensing components built-in. With the sensors installed, data loggers are capable of monitoring environmental conditions. While many of the data loggers are capable of monitoring temperature, only few can monitor all the conditions important to transportation such as temperature, humidity, pressure, light level, event occurrence, wind speed, time of use etc.

Conventional data loggers are manually turned on which triggers the built-in sensors to record the conditions after preset intervals of time. This recorded data is then stored in the equipped data storage unit. Such data recording takes place for the entire transit period of the cargo. After the shipment has reached the final destination the data stored in the memory of the data logger is transferred and analyzed. This analysis can be of different types depending on the cargo type and on the transit path it followed. For example, when the Silk Road railway is used, an analysis of temperature is essential over time as the cargo passes through the hot weather of China as well as freezing temperatures of Russia. These significant temperature variations expose the cargo to risks. By analyzing the data collected during transit, supply chain and logistic professionals can predict if the current state of the cargo is approvable or not after arrival or extra quality checks might be needed.

The usage of traditional data loggers has its limitations. First of all, as the data is not transmitted during transit and can only be retrieved upon arrival, it is almost impossible to detect and react to disruptions when they happen. If the cargo is exposed to unfavorable conditions for a certain period of time, supply chain managers have no way of knowing this which deprives them of the possibility to plan corrective action. Another drawback is that data loggers can only record data at specific intervals which leaves them 'in dark' during the unrecorded periods. Furthermore, as these devices have to be turned on and turned off manually, the process is exposed to possible human errors.

Types of data loggers

USB Loggers

Transfer data to a computer via a USB interface and do analysis on computer



Bluetooth

Transfer to a bluetooth enabled device such as cell phone or tablet to view graphical analysis



Web-based

Web based transfer enables remote, around-the-clock access to data via cellular, WI-FI, or Ethernet



Wireless

Transfer to central computer removes the need to manually retrieve data from individual data loggers.



Performance bottlenecks in data loggers

Even though data loggers cover basic cargo monitoring needs, the usage of conventional data loggers has significant drawbacks. First of all, data loggers are not able to transmit information in real-time, they allow for data extraction only after the cargo reaches the final destination. Data loggers do not have the capabilities to uncover and communicate unfavorable cargo conditions or unexpected delays. Therefore, they do not provide visibility into the cargo conditions while in transit and cannot be used to mitigate disruptions in the supply chain. The lack of real-time data makes it impossible to adjust supply chain and manufacturing planning to actual cargo situation and location. The data provided by data loggers cannot be used for planning pick up dates, inventory levels or manufacturing processes.

Furthermore, as these devices have to be turned on manually, they might provide dummy data from the point in time when the cargo was still not placed inside the containers. This negatively affects the quality of the collected data also that of data analytics which might be crucial when the cargo contains pharmaceutical products. Additionally, unreliable or incomplete data might not be sufficient for compliance reasons especially in the food, beverage and pharma industries.

Additionally, Data logger devices are purchased and not rented, thus it is an added expenditure by the company in long run. Companies using data logger technologies have to spend more for the devices which affects CAPEX. Moreover, one time usability puts an extra pressure on the companies for the device disposal. The decommissioning of the one-time-use data loggers, creates waste and thus affects the sustainability initiatives of the organizations. Data logger seems to be cheaper solution for cargo monitoring needs at first, but the added extra costs e.g. storage, administrative tasks of data extraction, technical expertise and data storage requirements make the overall solution comparatively expensive.

Data Loggers monitoring



Performance bottlenecks in data loggers

- 1 Retrieval of data needs experienced technician at the destination
- 2 The equipment will only record data at specified logging intervals. If something unexpected happens between recordings, the data will not be collected.
- 3 Real-time monitoring is not possible with traditional data loggers, data can be accessed only upon arrival to destination
- 4 Predictive analytics is not possible with limited data
- 5 Manual process is required to retrieve data from loggers
- 6 Corrective measures cannot be planned to mitigate supply chain disruptions
- 7 One time usability of data loggers make them economically not sustainable for the company
- 8 Require investment in the long run as they are purchased and not rented



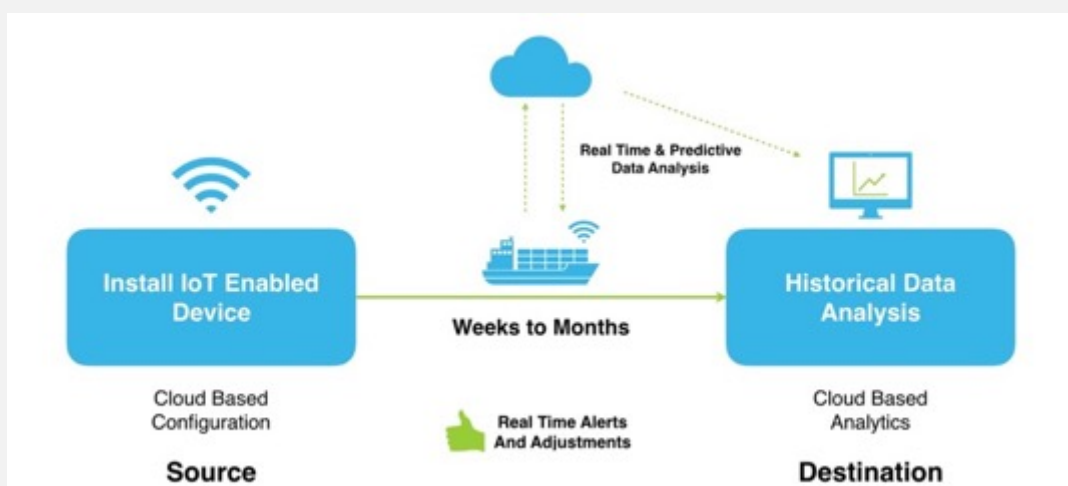
Supply chains after the era of data logging technologies

Innovative developments in the field of technologies over the years have significantly advanced data-logging techniques. The next generation of data logging equipment has emerged empowered by the Internet of Things (IoT). Besides the functionalities offered by traditional data loggers, IoT enabled devices are additionally equipped with wireless data transfer technology either using WiFi or Cellular. Thus, they can be used to monitor the shipments and transfer the collected data automatically in real-time and 24/7. This helps in collecting real-time data and enables rapid data analysis. The data can be transferred to a remote cloud storage, the analysis can be done remotely in real-time and the required alerts & notifications can be sent instantaneously to supply chain, logistics & operations managers in case something goes wrong with the cargo. This makes these more sophisticated, IoT enabled devices more preferable to monitor sensitive or high value cargo.

IoT enabled real-time data analysis does not only solve the challenges faced by conventional data loggers but also opens new frontiers

- ✓ Immediate action can be taken in case the required conditions are not satisfied during transit; this is a basis for risk mitigation and waste reduction.
- ✓ New data such as real-time geolocation of cargo can be recorded which improves planning by resulting in a more sophisticated ETA calculation.
- ✓ Thanks to the integration with the cloud, multiple users can access the collected data. This reduces the administrative workflow and communication efforts between stakeholders.
- ✓ As data can be recorded more frequently than with data loggers, IoT based cargo monitoring allows for deeper control from the shipper and the receiver and satisfies requirements for compliance.
- ✓ Thanks to the integration capabilities via API to your control tower, ERP, TMS etc., you are able to automatically retrieve data from the cargo monitoring platform and integrate it to on-premise systems and applications

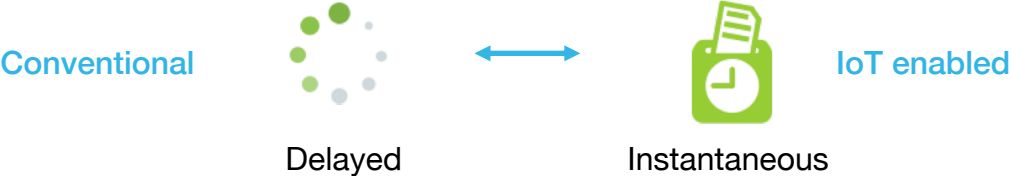
IoT enabled real-time monitoring



Differences between using IoT enabled devices and conventional data loggers

1 Data Availability Post Shipment vs Real-Time Data Stream

Traditional data loggers accompanying cargo are post transit data analysis tools and provide shipment details only after the shipment has arrived to the destination. Important conditions such as temperature, humidity and insider shocks during the transit are not revealed and addressed. One cannot be proactive in these situations. Data loggers are thus going out of fashion and are getting replaced by technologically advanced devices that are capable of providing real-time, actionable information. An IoT enabled device residing with your shipment gives you real-time data updates so that you can react to disruptions when required before they would negatively affect business operations or customer satisfaction.



2 Limited Data Accessibility vs Instantaneous Data Exchange + Analytics

Data loggers are not equipped with communication technologies, they are incapable of sending real-time data. Data on shipment conditions is stored only in the one single device that is riding along with the shipment. This does not communicate until data is extracted from its memory. With IoT enabled real-time sensing and analytics technologies all the interested parties can access the data at the same time mostly via easy to use, cloud-based user dashboards. The dashboards are updated automatically and in real-time so the manual effort of extracting information and sending it across in multiple emails to stakeholders can be eliminated.



Differences between using IoT enabled devices and conventional data loggers

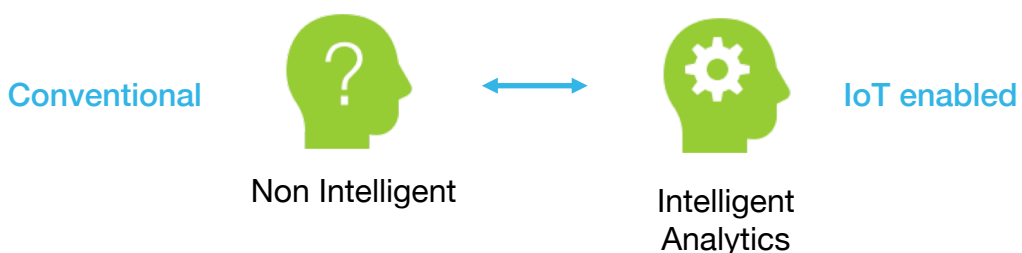
3 Manual Setup vs Automatic Data Transfer

To extract and analyze data from traditional data loggers, a specific software and data wiring is necessary to be installed at the receiver's side. This can often cause problems with the quality condition monitoring of perishable products like milk, chemicals, fruits, flowers and vegetables. If a proper software with wiring is not available at the receiver's end, these products can become stale while waiting for verifications. IoT enabled technology transfers data instantaneously. This enables hassle-free monitoring of required conditions. The shipments can be handed over to the buyer without any delays, as soon as it has reached the destination. Furthermore, when the data transfer happens automatically on the cloud, no additional infrastructure is required for data transfer or data analysis.



4 Non Intelligent vs Intelligent Analytics

Can data loggers help you to make predictive analysis about shipment risk management and financial management? Not Really! Data loggers are 'non-intelligent' devices only collecting and storing data until it is retrieved by a user. On the other hand, with the software connecting to real-time IoT technology, intelligent reports on performance management or various quality metrics are easier to generate with just a few clicks. The collected data can then be used for making predictions on efficient management of future shipments. Data intelligence is the key component that analyses and accumulates information on shipments, exposes risks and empowers businesses to make better decisions.



A checklist that can help you chose one of the solutions!



What kind of supply chain visibility do I need?

No real-time conditions need to be monitored

In need of a cheap solution!

Not in need to adopt digitalization

Sustainability is not important for organization

Data extraction time does not affect the delivery of your shipment

Preference for investment on purchasing one time usable hardware

Predictive analytics is not a prime requirement of your supply chain operation

Can access and assess collected data with manual processes

Instant sharing of data to multiple parties is not a requirement



Data logger

Real-time monitoring of the products in transit is required

In need of a customized solution

Requirement of technology that supports digitalization

Sustainability is key for the organization

In need of proactive solution allowing immediate response to disruptions

Preference for pay per solution with no investment on hardware

Predictive analytics and risk management is needed

Needs integration with current systems e.g. ERP, TMS

Immediate access and sharing of data to all the interested parties is required



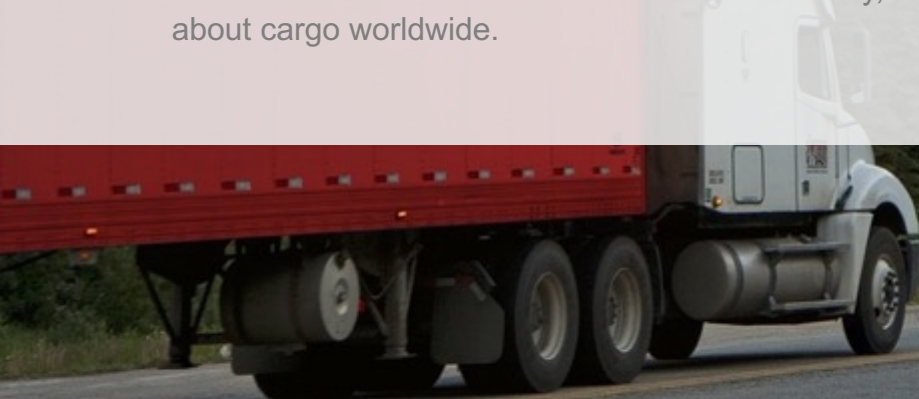
IoT Solution

Is your organization still relying solely on loggers to track your valuable products while in-transit? Arviem's service can help you provide end to end supply chain visibility and help you to reveal inefficiencies in your supply chain.

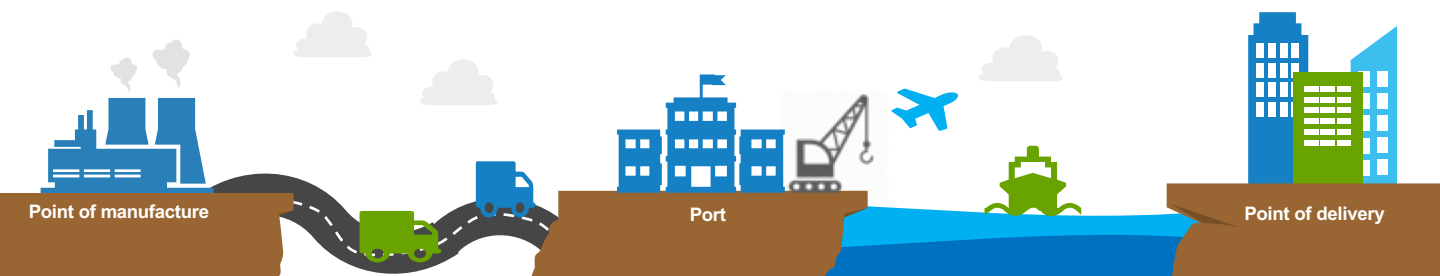
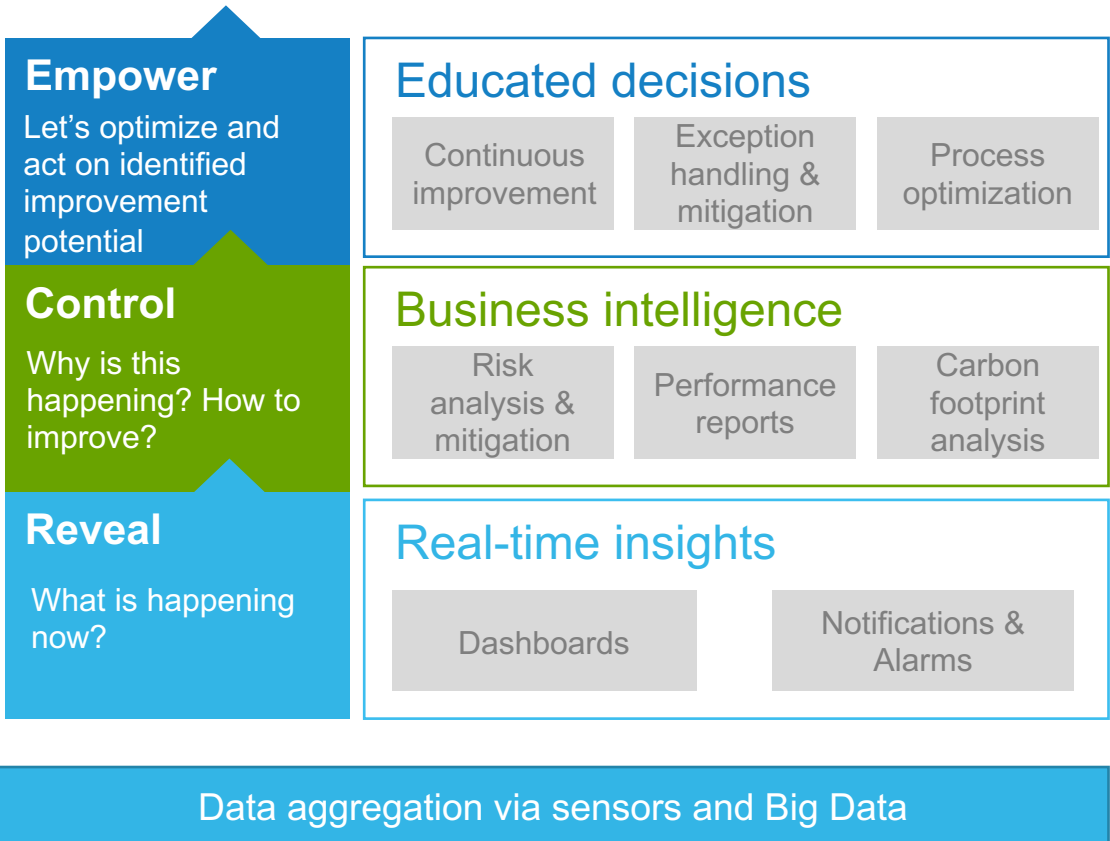


Monitor your logistics chain with Arviem's IoT enabled real-time tracking devices

Arviem's supply chain visibility solutions support their users in the efficient management of strategic, operative and financial supply chains via enabling real-time data-driven decision making. Arviem eliminates milestone based supply chain visibility solutions and provides a constant data stream on the location and condition of cargo in-transit. The installed automated locating and sensing technology on multimodal containers and cargo addresses the need of decision makers for end-to-end, timely, quality data. The basis of Arviem's service is the accumulated trustworthy, carrier independent data about cargo worldwide.



The Arviem supply chain visibility and cargo monitoring operating model



Why Arviem?

We operate **worldwide** and offer a **full service**

We provide **multimodal** cargo monitoring solutions

We offer '**pay-as-you-use**' service, no investment needed

We guarantee **24/7** customer service

Our solution is up and **running in a day**

We have **long established expertise** in the industry

We operate from and develop our software in **Switzerland**

*"We have eliminated waste,
reduced demurrage costs
substantially and achieved timely
product availability and product
freshness."*

Nestlé on Arviem's Services





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