

Data acquisition done better, cheaper and faster

An efficient and scalable way to get data from your existing production process

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Introduction

Peter Drucker once wrote: *"What gets measured, gets managed"*.

In manufacturing today Digital Manufacturing (DM) or Industry 4.0 (I4.0) are the next steps in process optimization. Where Lean was driven by insights from people close to the process, DM is driven by data gathered from the production process. But getting data out of machines that were not designed with data gathering and connectivity in mind can be (made) very complicated and expensive. We bring a solution with the following advantages:

- Gain insights in your Overall Equipment Effectiveness (OEE)
- Get a solution that can be deployed quickly without any impact on operations
- Realize a platform that can be extended with Industrial Internet of Things (IIoT) sensors for better understanding of the working & optimization of equipment

Case

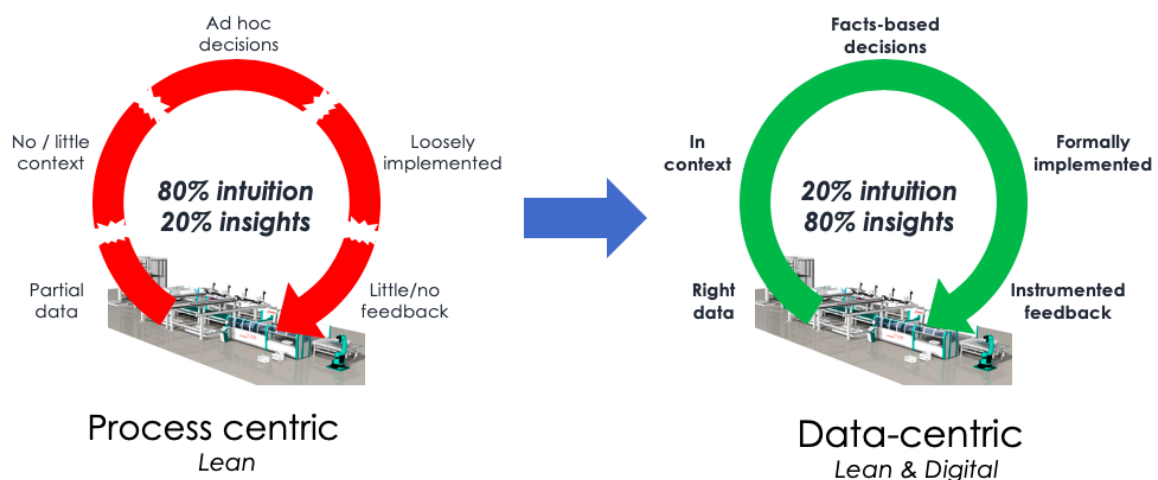
We were asked to do a survey of a factory. The plant was the result of years of acquisitions and mergers. This plant was built in 1890 and through the years it had changed a lot. Production lines were added, machines replaced, automation was introduced. Machine ages differed by some 20 years. The older the production line, the older the staff working on them. On some lines, the controllers (plc's) were so old that nobody knew anymore what their setting were, or who programmed them in the first place. Also, it was unclear if these machines could provide data. At least they were not designed for this. Some lines were not running due to staff shortage. And there seemed to be very little fixed procedures: every operator had their own settings because they were relying on experience as they had no real time information. Process information, notification, it was all done by hand on pieces of paper. In the central office this information was manually transferred onto an excel sheet for analysis.

The above is a very typical situation. And each case is different, so you never know what you are going to find. Unplanned downtime sometimes has its root cause in a lack of toilets. In one case it turned out that the toilets were so far away from the production lines that the operators had to stop production when nature called. Data also sometimes shows inefficient patterns around lunchbreaks, batches that have been mixed too short for example. But you can only find these things out when you start analyzing data.

Manufacturing process optimization

(Production) process improvement has been a subject of study for a long time. Lean manufacturing has become a popular way to continuously improve (production) processes using insights (data) from the people closest to the production line. Now Digital Manufacturing is taking process optimization to the next level by also using data to pinpoint bottlenecks and prioritize improvement priorities.

The big difference is that continuous data ensures continuous feedback and enables facts-based decision making.



But how do we know where we need to improve and how do we get the right data?

What we try to optimize

- Increase Overall Equipment Effectiveness (OEE), as dictated by Quality, Performance & Availability
- Increase Material Efficiency by reducing scrapping and improving process yields
- Reduce the Fixed Manufacturing Costs, such as energy, utility and maintenance costs

We want to leverage sensor technology and available production process data to achieve above benefits. The result will be a solution from production process to business value.

The problem with getting data from an existing production process (brownfield)

If you are looking to extract data from an existing production process (also called a brownfield) there are many challenges.

Operational risk

First and foremost, you have to be careful not to upset the current process. A production process that has been established through the years may have all kind of (unknown) interdependencies. It is truly a black box, and the risk of a production halt and the associated cost is often too high to run. So just replacing a plc or even changing it means too much risk.

Political risk

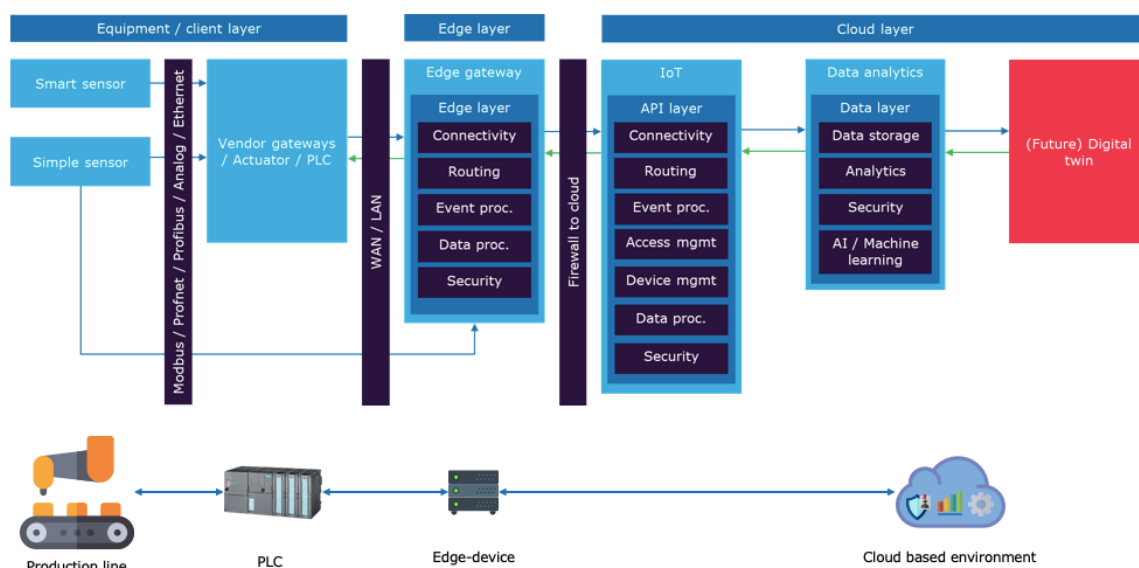
A plant with an in-house system integrator is seldom found. Brownfields are often purposely built. Through the years change upon change was made, making every situation unique. The system integrator (SI) responsible for the work is sometimes not available anymore. Also, the SI might not be aware of the latest technology trends nor do they have a big interest in setup of third-party improvements. So, one should expect little help from the SI side.

Industry 4.0 architecture

To work within the boundaries the best option is to use data from the existing control layer but send it to another layer. For this reason, brownfield integration requires flexible and smart so-called edge devices. These edge servers have to be connected to the control layer to:

- Collect data
- Pre-process this data and temporarily store it
- Send data to the cloud for further analysis and dashboarding
- Add (cyber) security to the system
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The reference architecture for Industry 4.0 would then look like this.

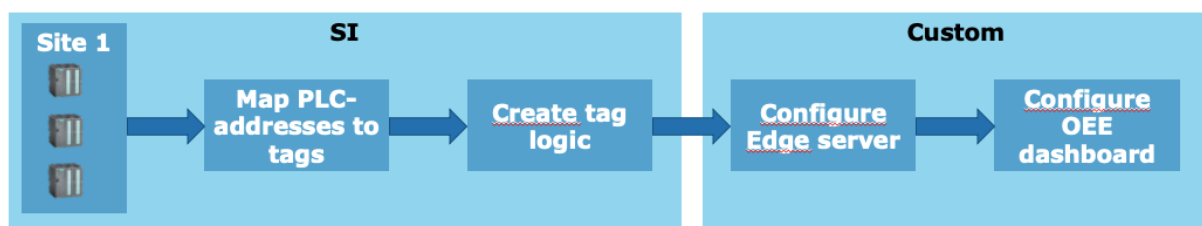


Current way of working

Until now when we were faced with a production site that needed data extraction we would speak to the local SI. His job consisted of

1. Getting the data out of the plc
2. Labelling the data with a tag for identification
3. Creating a tag logic for structure.

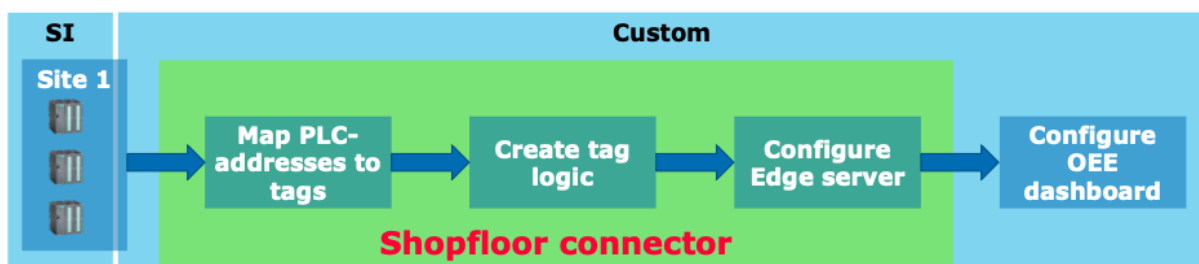
We would then receive the data in an edge server. This server was used for distributed logic (sorting data, first 'real-time' check for problems so that a quick resolution can be found, securing the data). And finally, we would display the resulting analytics in a dashboard.



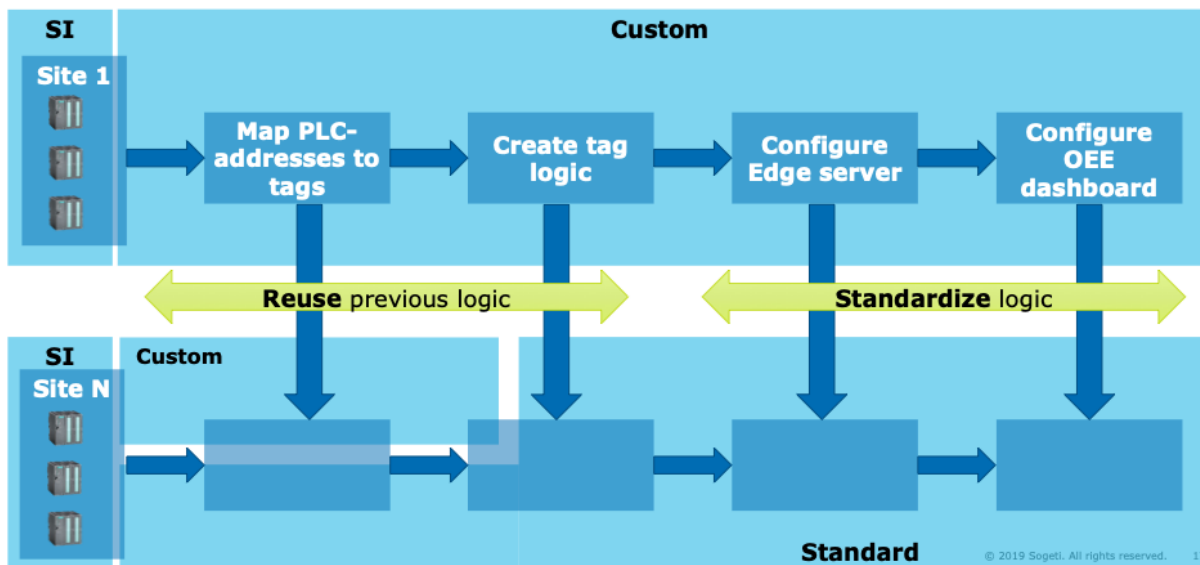
For reasons which we already mentioned this proves to be a time consuming, expensive approach which means that it is not attractive for a lot of clients.

Our solution for efficiency and scale

We have now created a new way of working that solves the issues mentioned. In this way of working we introduce a shop floor connector. **This connector allows us to leave the existing control layers untouched.** In the connector we can do the tagging of the data with accompanying logic without being exposed to any operational risk. Because we create the tag logic in our shop floor connector, we can ensure that the resulting input for the edge server is standardized. The result is that we can standardize the configuration of the edge server and dashboard logic.



Multiple factories with the same processes could then be connected using the tagging logic of the first one. This reuse of logic to create a standardized input for the edge server and dashboard gives us big scale advantages.



Conclusion

We are often asked to help when people need help in making efficient use of today's technology. In this case because today's technology seems difficult or expensive to integrate with yesterday's control systems.

We used the example of a plant but there are far more situations where brownfield control layers have to be connected for data extraction and for the addition of sensors for example.

In infrastructure you could connect the control of bridges, tunnels and locks, which often seems to be outdated. In Ports you could centralize the container handling equipment control layer while for Electricity providers you could connect the powerhouses to remotely monitor performance and share best practices.

There is a wide host of possible applications for our solution. The benefits fall to all use cases:

- Gain insights into the use through for example Overall Equipment Effectiveness (OEE)
- Get a solution that can be deployed quickly without any impact or risk for operations
- Realize a platform that can be extended with Industrial Internet of Things (IIoT) sensors for deeper insights in working & optimization of equipment

If this whitepaper has triggered your curiosity, please reach out for more information or a chat Jorus.everaerd@sogeti.com

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