Automation as the Edge Node of the Industrial Internet

The foundation for your digital journey

Executive Summary

Automation technologies have been around for many years. They were the trigger for what many call the third industrial revolution. Now that we have reached the fourth one, known as Industry 4.0, many companies are rethinking their future and trying to understand how they can realize value out of their digital transformation. In this context, what role does the automation layer play?

In this white paper, we will discuss why automation solutions are an intrinsic and key piece of the process, allowing for a smooth transition to a digital era. Transforming data into information, and then into insights using analytics to bring true value to operations and the business. In this context, automation is the layer on which users can build their digital transformation.

Automation and Industry 4.0

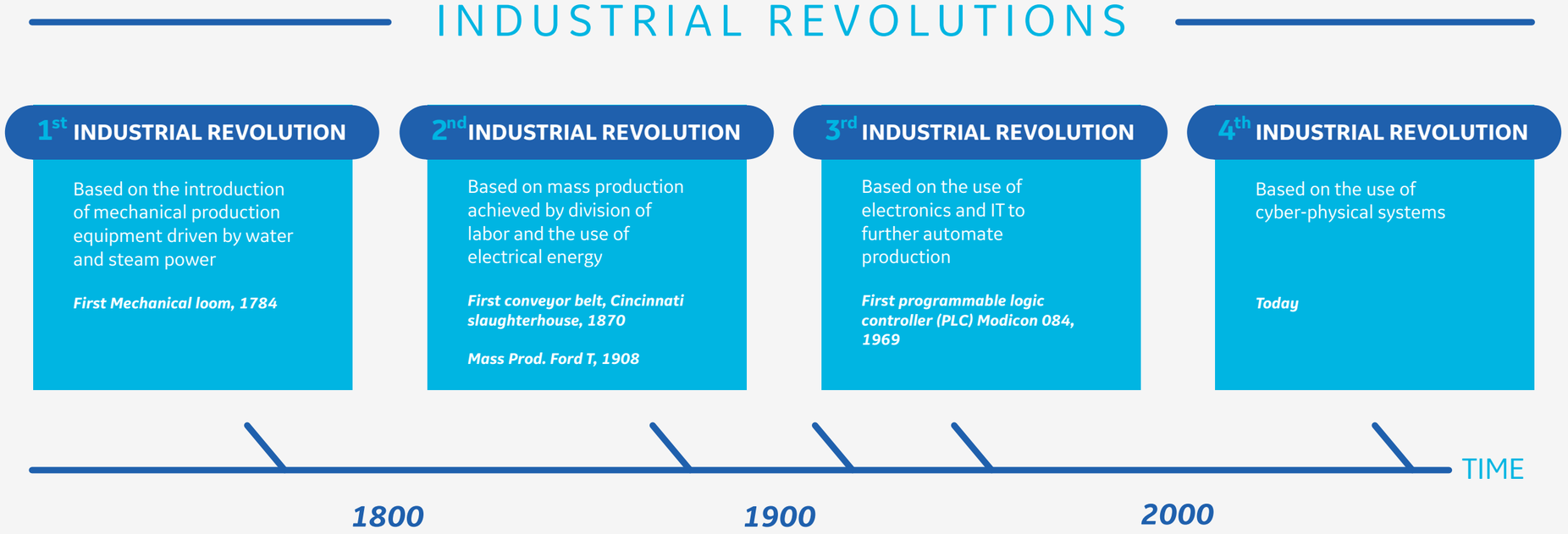
Automation technologies have been around for many years, but have not fundamentally evolved since. Looking at the software side of it, like HMI/SCADA, the basic capabilities are still the same.

To this day, the main goal is to provide the operator with a window on his application using mimics, trend views, alarm views, etc. However, new technologies have made HMI/SCADA more powerful, easier to use, and more connected. Welcome to Industry 4.0.

Industry 4.0 refers to the fourth industrial revolution (see Figure 1). The first revolution is the introduction of mechanical production at the end of the 18th Century, the second is the introduction of mass production at the end of the 19th to the beginning of the 20th Century, and the use of electrical energy. The third revolution—in the late 1970s—happened based on the use of electronics and IT systems to automate production using what is considered to be the very first PLC, which launched in 1969.

The fourth industrial revolution is based on the use of Cyber-Physical Systems (CPS). A common definition of a CPS is any mechanism that is controlled or monitored by computer-based algorithms, tightly integrated with the Internet and its users. CPSs, the Internet of Things (IoT), and new computing capabilities—such as cloud computing—are what make Industry 4.0 possible.

Many companies are rethinking their future and trying to understand how they can capitalize on Industry 4.0 and realize value out of their digital transformations. In this context, the automation layer has been an enabler over the past 50 years.



Why now?

Why has this revolution not happened earlier? The answer is simple: the technology was not available until recently. This includes the availabilty of cheap sensors, high speed networks, the ability to manage huge amounts of data at a reasonable cost, unprecedented computational power, and ,of course, the cloud.

Each of these represent a disruption in the traditional model. For example, the rule was to only collect and store the pieces of data that were necessary, either for operational or compliance reasons. Today, data collection and storage are much cheaper than they were. The trend is to collect vast amounts of data and store it without knowing what will be done with this data.

New forms of human interactions such as touch interfaces or augmented reality systems are another form of disruption. So is mobility. We all expect to be able to access our personal information from anywhere and at any time with our smartphone; the same applies to process or manufacturing data. A plant manager who is on the go wants to be able to keep an eye on his plant while he is away from his office.

Digital transformation is a journey

Digital transformation doesn't happen overnight, it's a journey. Like every journey, it must include a clear and achievable goal, whether it is financial, operational, or something else. It must also include the rights steps to make the journey sucessful.

To do this, it is recommended to ignore the IT and OT aspects and take one step back to identify what the main challenges are. And it never hurts to include a pair of external or fresh eyes here.

For example, how can you save in production losses to be more competitive? How can you optimize maintenance strategies and cut processing time? How can you mitigate risk and increase productivity?

Once the goals are set, the next challenge is to draw an implementation roadmap. Many industrial sites have already embarked on the journey without knowing it, like Molière's character—Monsieur Jourdain—speaking prose without even knowing it. We are mostly dealing with "brownfield" applications in Europe and most of them have some kind of automation system installed, an MES or another type of manufacturing management solution in place.

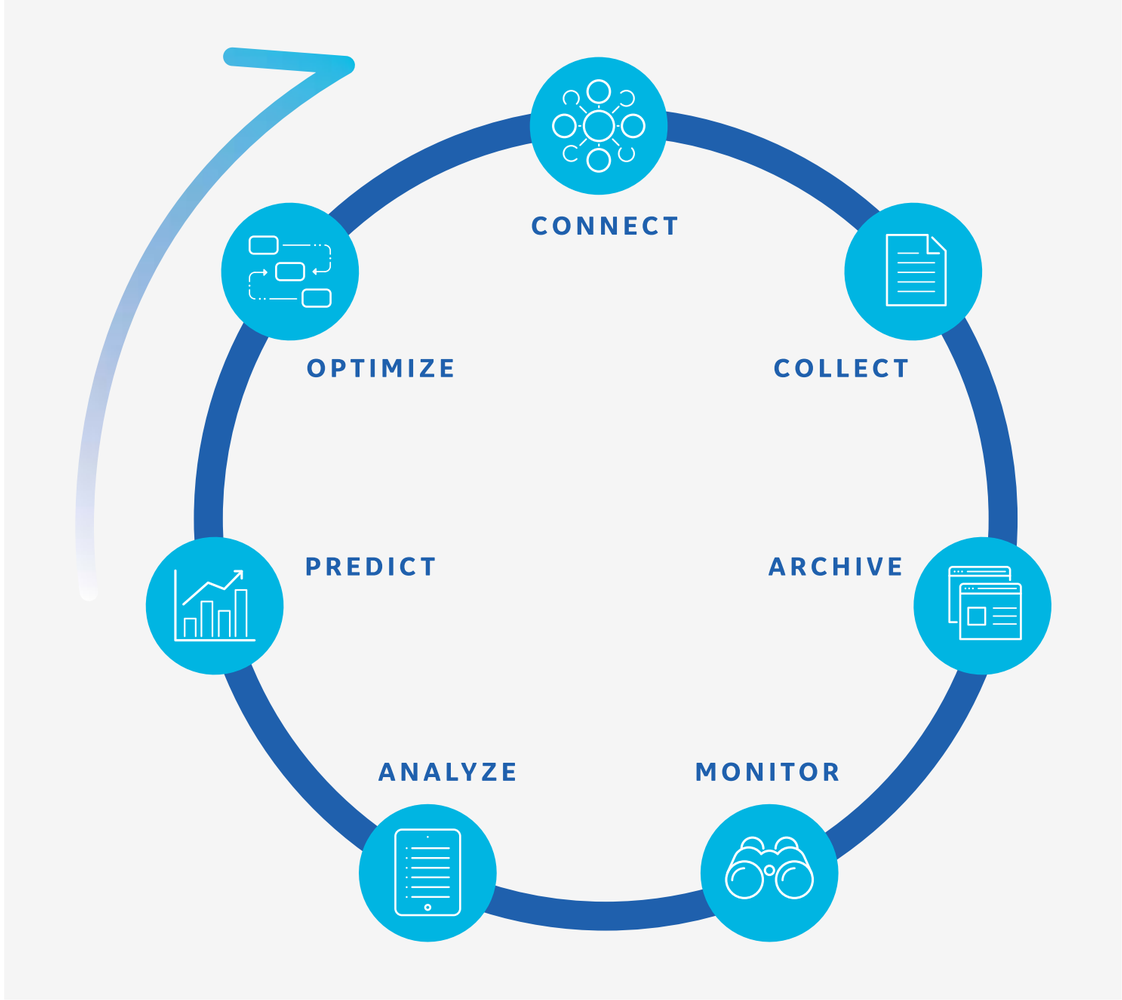
Figure 2 gives the user a good indication of the maturity level of his application. The automation layer helps solve one of the key problems faced by the industry, which is the data gap—islands of data or production systems that are not connected.

Problems that the automation layer solves

One of the key challenges identified by Industry 4.0 and the Industrial Internet Consortium is interoperability. With the emergence of standards like OPC UA, this is becoming less of a problem. When OPC UA is applied to the automation layer, not only does it deliver connectivity, but is also ensures the security of data transfer in a structured way.

You can't control, analyze, or optimize what you cannot see. The flexibility of the automation layer helps bring all the required data and can bridge the gap between disparate systems at low cost, this with the speed and accuracy required to be able to have a holistic view on someone's application.

Another topic that is often unknown by the IT engineers is the performance and near real-time nature of the automation layer.
You cannot replace a control system with a cloud-based solution. Control systems are down to the millisecond resolution and HMI/SCADAs deliver sub-second view and control on the processes, not the performance that a cloud-based system could deliver.



Digital transformation and the cloud

Digital transformation doesn't always mean cloud.

A lot of tools can be deployed on-premises, as part of the automation solutions, in order to make operations personnel more efficient, reduce the risk of errors, and improve work consistency, positively impacting the compliance of their process if applicable, and ultimately the bottom line.

Digital work process management software delivers huge outcomes and can be seamlessly deployed on top of an existing automation layer, enabling the (almost) paperless plant. Typical applications range from Standard Operating Procedures (e-SOPs) to maintenance procedures or operator rounds.

Automation as a way to mitigate the risk of disruption

It is key for existing plants or infrastructures to ensure that there will be no disruption in the production process or operation itself during digitization. Users who have been through the implementation of an ERP system are often reluctant to change. They fear a disruption in their process, involving unexpected downtimes and tools that will confuse the workforce, or will require extensive training. Quite the opposite of an ERP, it's recommend to start small and deploy at your own pace. As we have seen earlier, the first step is to modernize what exists, look at the gaps, and build on top of it.

Automation technologies can help mitigate the risk of disruption. They are mature and proven technologies that can deliver new capabilities while making sure that the application remains safe, available, and compliant.

Also, the digital transformation process must take the user into account and make sure that he is only affected by the changes in a positive way. The aim is to make the life of the people easier: operators, engineers, production managers, etc. Nowadays, industry users expect the tools they have at their disposal in their everyday life to be available at work. Modern HMI/SCADAs can deliver content on any connected device—PC, smartphone, tablet—giving them the tools that fit their needs and deliver the same user experience to their own device. Mobile devices have demonstrated the ability to increase their efficiency. A recent study from Canada shows that mobile operators are 30% more efficient than the ones using a fixed device.

Going the extra mile

Once the foundations are strong, you can build the rest of the house. 85% of the data used by analysis and analytical tools, such as Asset Performance Management (APM) software or Operations Management Software (OPM), come from the field (OT data). They represent the second part of the journey.

Gartner defines APM as a range of solutions that encompass the capabilities of data capture, integration, visualization, and analytics tied together for the explicit purpose of improving the reliability and availability of physical assets.

There are three big drivers that have plagued infrastructure owners and operators since the commissioning of their operations: How to simultaneously improve availability, manage risk, and reduce costs. The ultimate goal is to ensure optimal asset performance to maximize your desired outcomes.

Many users begin at the risk stage of this scenario. This involves a process of assessing the criticality of all the assets within their business as high, medium, and low. APM delivers an optimized plan to reduce costs while appropriately mitigating the risk of failure based on consequences and probability.

The user is encouraged to develop asset strategies, which are targeted holistic and optimized activities that specifically mitigate potential risk for the asset failure through preventive and predictive maintenance, inspection, monitoring, engineering, and analytical methodologies.

Pieces of equipment age, business and compliance requirements change, process conditions alter, and asset health can deteriorate over time. APM can dynamically monitor emerging threats and automatically take actions—ranging everywhere from a notification that the strategy should be adjusted to or automatically creating a recommendation for corrective repair work to be done.

Recommendations issued by the analytics are then fed back to the process, via the automation layer; whether it is through an HMI/SCADA, in which case the operator will be able to check the recommended parameters before they are sent to the actual process, or directly to a PLC.

Once again, transforming data into information, and then into insights using analytics brings true value to operations and the business. This is the core of APM applications. It is all about making more informed decisions, being proactive, and optimizing processes.

Conclusion

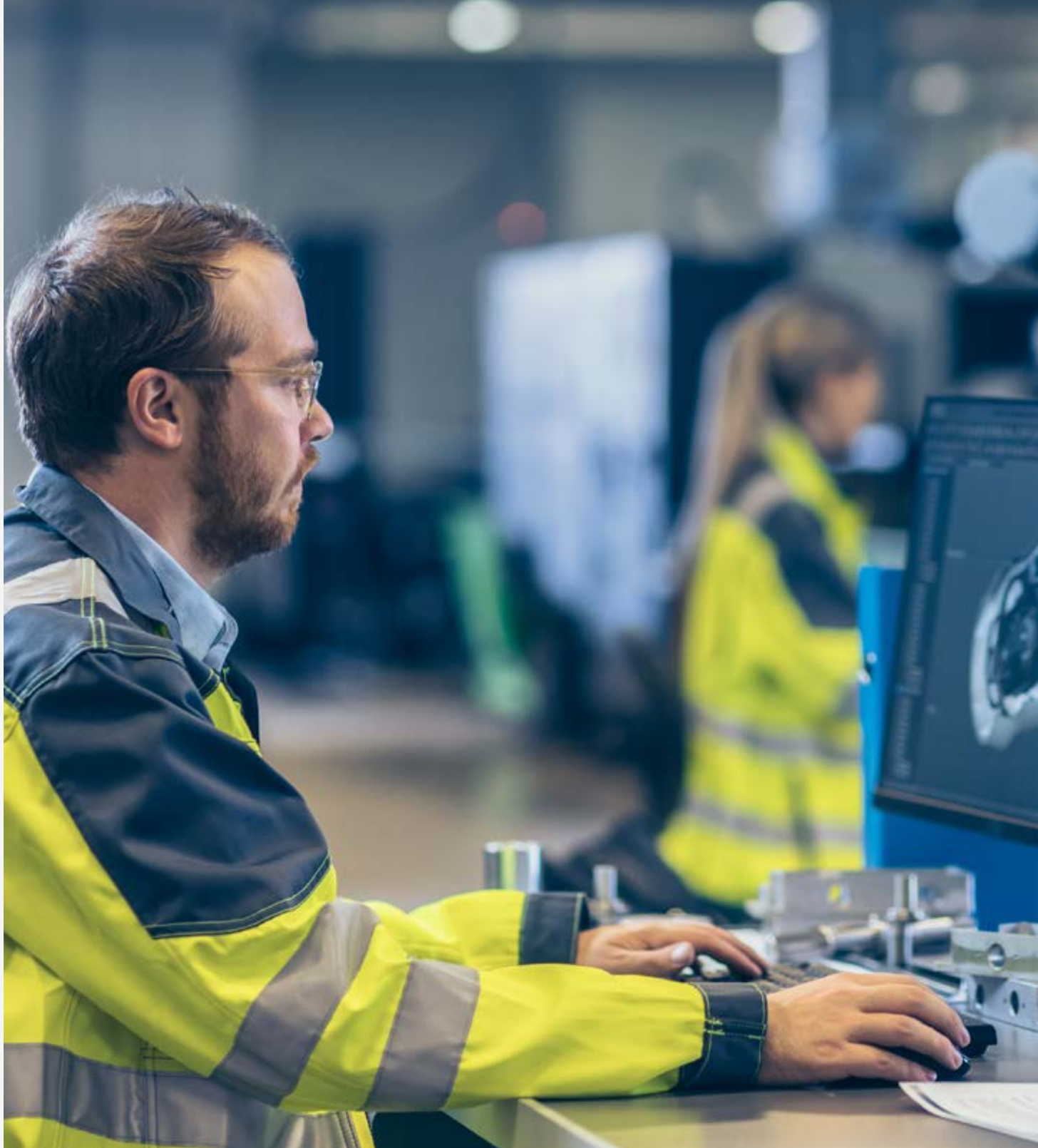
In summary, if you're looking at your digital transformation journey, it starts with the automation layer. By leveraging automation as the foundational piece of your digital transformation, you can capitalize on many of its benefits, such as:

- It delivers easy connectivity, complete visibility, and control
- It enables digitization of the plant floor without any disruption
- It is the trusted source of the majority of data used for analytics and optimization
- It is an onramp to the cloud and the analytics

References

Industrie 4.0: Federal Ministry of Economic Affairs and Energy

OPC UA: https://opcfoundation.org/about/opc-technologies/opc-ua/



About GE Digital

GE Digital is reimagining how industrials build, operate and maintain their assets, unlocking machine data to turn valuable insights into powerful business outcomes. GE Digital's Predix portfolio—including the leading Asset Performance Management, Automation and MES applications—helps customers manage the entire asset lifecycle. Underpinned by Predix, the leading application development platform for the IIoT, GE Digital enables industrial businesses to operate faster, smarter and more efficiently.

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