

Machine Controllers in the era of IIoT are multi-tasking like never before...

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The IIoT is all about communication, and the latest machine controllers are at the heart of that new extended infrastructure. Historically the role of the machine controller was firmly embedded in operational technology (OT) whereas now the crossover with IT and internet enabled systems is multi-layered.

Today, high-end machine performance is often delivered via a PLC / Machine controller that also communicates with other machines in real-time, provides live production data and feeds information directly into upper-level systems such as SCADA (Supervisory Control and Data Acquisition). In addition to managing safety monitoring systems, supporting OEE frameworks, sending big data to Edge controllers and cloud-based processing solutions, it will provide MES layers with operational data and even help manage active AI enabled maintenance systems.

The requirement to multi-task while maintaining precise control over a machine (or multiple machines) means a modular PLC construction is more important than ever. The latest IoT Gateway available for Mitsubishi Electric's advanced iQ-R Series PLC is a perfect example. It makes use of the OPC UA standard designed to provide a direct exchange from smart OT devices to cloud based systems.

In combination with an ICONICS SCADA suite the IoT Gateway can be used to access real-time-data from multiple robot controllers (and various other automation devices) and make them available for easy on-screen monitoring and management both on-premise or in a cloud environment. This allows companies to benefit from predictive maintenance functionality built-in to the robots which uses AI to predict requirements a long way ahead of time and make suggestions for servicing or parts replacements. The flexibility to see this information and act upon it from anywhere in the world empowers plant operational personnel to work remotely and take proper advantage of their Smart factory.

Expanding the theme to achieving higher production outputs and efficiencies, a plant-wide automation system can also be driven by the machine controller and its communication modules. An IoT Gateway and iQ-R modular PLC can be used as a hub that drives a simplified IIoT enabled control and

management environment. It effectively makes the most of the controller's capability while creating transparency within the IT systems.

From a manufacturing perspective, introducing a time sensitive network such as CC-Link IE TSN can increase the speed and synchronicity of a production line significantly. Micro-delays and bottlenecks can be effectively eliminated by ensuring that everything from in-feed machinery to CNC machines tools, conveyors, assembly systems, testing, marking, robot loading systems, packing and palletising is synchronised in real-time.

In a practical sense this ecosystem doesn't work in isolation though, which is where OPC UA, MQTT and the likes of Azure IoT Hub come in, linking ERP and MES layers to the PLC at the heart of the system via the IoT gateway. Allowing personnel all the way from production to senior management to pull reports and plan factory output based on demand and availability.

The role of the machine controller in the IIoT environment also extends to integrating seamlessly with an Edge controller or cloud processing platform with additional operational benefits. Edge computing is gaining more and more importance for data analytics, offering a low latency solution where big-data is interpreted, and the trends recorded rather than just stored en-masse. At the same time, cloud computing is also useful for carrying out complex, but less time-sensitive analysis on larger data sets required for deep learning models.

Mitsubishi Electric's solution for Edge computing, the MELIPC, captures data seamlessly from the PLC and can process, filter and provide initial analysis locally. The most relevant results can be acted upon locally, while data needing more advanced analytics can be sent to the Cloud. The MELIPC addresses the need for processing as close as possible to the control system, while also providing using several of the same protocols as the IoT Gateway, for integration with the Cloud, including OPC UA and MQTT.

This also serves as another example of enabling AI, the MELIPC uses machine learning to analyse collected data and generate a model of the machine's operational state. This model can then be used to detect variations in the machine's performance in real time, again, providing feedback to other IT based systems to provide early warnings and advice that can impact on quality, efficiency and output volumes.

These practical examples clearly illustrate how increasingly sophisticated machine control systems are finding their place in the world of the IIoT era.

Image Captions:



Image 1: Christian Nomine, Mitsubishi Electric Factory Automation EMEA, Strategic Product Manager Visualisation & Analytics.

[Source: Mitsubishi Electric Europe B.V]



Image 2: Easy on-screen monitoring and management of multiple robot controllers is available both on-premises or in a cloud environment thanks to the ICONICS SCADA suite.

[Source: Mitsubishi Electric Europe B.V]

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*U.S. dollar amounts are translated from yen at the rate of ¥122=U.S.\$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2022.

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Offering a vast range of automation and processing technologies, including controllers, drive products, power distribution and control products, electrical discharge machines, electron beam machines, laser processing machines, computerized numerical controllers, and industrial robots, Mitsubishi Electric helps bring higher productivity – and quality – to the factory floor. In addition, our extensive service networks around the globe provide direct communication and comprehensive support to customers.

Factory Automation EMEA

Mitsubishi Electric Europe B.V., Factory Automation EMEA has its European headquarters in Ratingen near Dusseldorf, Germany. It is a part of Mitsubishi Electric Europe B.V. that has been represented in Germany since 1978, a wholly owned subsidiary of Mitsubishi Electric Corporation, Japan.

The role of Factory Automation EMEA is to manage sales, service and support across its network of local branches and distributors throughout the EMEA region.

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In summary, e-F@ctory and the e-F@ctory Alliance enable customers to achieve integrated manufacturing but still retain the ability to choose the most optimal suppliers and solutions.

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