Artificial Intelligence
Machine Automation Controller

Introduction

The Omron AI Controller is a new solution that is uniquely able to Collect → Analyze → Utilize data on the Edge within a Sysmac controller, for the purpose of extending equipment lifecycle. This solution functions completely at the machine (Edge) level, without any required network connectivity to additional local on-premises (Fog) or off-premises (Cloud) infrastructure. It applies a Machine Learning engine to perform real-time Anomaly Detection, synchronized with the machine control cycle, in order to allow the machine to programmatically make data driven decisions on corrective actions during operation. This solution ensures the highest speed and highest accuracy of data collection and analysis, with the highest level of data security, and the lowest overall cost of implementation. This guide provides the basic sales information.

Highlights

- Machine Learning implementation within an industrial Edge Controller
- AI processed in parallel within Sysmac NX7 or NY5, maintaining controls performance speed
- Data and analysis kept local to machine within NX7 or NY5, without network/cloud connection, ensuring highest data fidelity and security
- Anomaly Detection machine learning algorithm optimized for high-speed & high-accuracy
- Utilize AI results within standard Ladder/ST controls program, synchronized with control cycle
- Sysmac Library of pre-engineered Function Blocks that assist with Predictive Maintenance on common mechatronic devices (Air Cylinder, Ball Screw, Belt/Pulley), no data science required
- Paid Service provided by Omron engineers to start-up and train system on application-specific data and parameters, no data scientist required
- Annual Subscription for continuous system relearning and access to new Function Blocks

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Target customers

1. Highly specialized product with expensive or complex process that would benefit from Anomaly Detection to maintain high product quality or reduce costly scrap/line-damage, typically not interested in this data going to alternative Cloud based services due to high confidentiality of IP regardless of speed of utilization

2. Very high volume production of relatively inexpensive or simple product that would benefit from Anomaly Detection to reduce even the slightest production stoppage or save some small cost per each product, typically not able to use alternative Fog/Cloud based services due to high utilization speed requirements

3. Machine builders who want to differentiate their systems by providing the capabilities and relearning services to their end customers, optimizing equipment life without requiring cloud service setup – typically end-user targets that fit Target 1 & 2 above

Key strategy

With "AI" as a very prevalent and commonly misunderstood buzzword, this product should be leveraged to engage in high-value discussion, but the product itself is not for everyone and every application. Showing our unique capabilities and targeted approach to the market will improve credibility and recognition of Omron as a high-tech automation company, and sales team member. For those customers who fit the product and strategy, the Omron AI Controller can be very powerful and create a large sales opportunity not easily replaced.

Focus the discussion around what value the customer might find in automating data-driven decisions from within their machine utilizing Anomaly Detection.

- The easiest sales path is to a customer using Sysmac currently that can benefit from the value of automated data-driven decisions based on Anomaly Detection to extend their equipment life, ensure product quality, or provide a more competitive solution against their competitors. The challenge will be to help the customer justify a migration to the NY5 or NX7 Sysmac controllers over what they have currently designed, based solely on the Machine Learning capabilities.

- If a non-Sysmac customer has already started previous IoT or Industry 4.0 initiatives using Fog or Cloud solutions, then that is the perfect opportunity to explain the difference in our Edge solution – many of the costs associated with Fog/Cloud solutions would be eliminated. Then the challenge will be to sell Sysmac as a replacement to their current controls platform, based on the performance enhancement and cost reduction of an integrated AI & Controls platform.

- If a non-Sysmac customer has not yet attempted an IoT or Industry 4.0 initiative, the challenge will be two fronts: selling Sysmac as a replacement to their current controls platform, and educating the customer on Machine Learning as a potential solution as a whole. This situation will be the most challenging and take the most resources to overcome, so opportunities will need to be larger in order to justify the priority.

Sales process

Specific Omron Account Managers and Strategic Account Managers have been trained according to the initial target customer list and strategy, focusing on customers with highest likelihood of success. Specific Omron Field Application Engineers have also been trained according to those same customer accounts. If during conversation with a customer there seems to be an opportunity for further exploration, please contact your Omron Regional Sales Manager or Omron Strategic Sales Manager to see who has been trained in your local department. They will be able to assist in communicating the value of the product, perhaps bringing in a Field Application Engineer or Marketing member for support.

Before quoting, it is important that a trained Omron Field Application Engineer understands the customer application and where Anomaly Detection is intended to be used. Quotes must include the AI Controller hardware, and paid Startup Service with scope of work agreed upon with an Omron Engineer.

Leading questions

- Are you currently working on any IoT or Industry 4.0 initiatives?
- How are you currently analyzing your machine data? Is it on-premises or in the Cloud?
- How quickly are you able to detect an issue with your equipment using your current data analytics solution? Could there be more value if that time was reduced?
- How are you handling cybersecurity and timestamp synchronization with your data analytics?
- Is there anyone looking at machine learning or anomaly detection for your production as a way to increase production, or ensure higher yield, or maintain product quality?

Resources

Internal and Customer presentations are available via MyDashboard and Omron Marketing. Contact Mike.Chen@omron.com. The AI Controller Product Brochure is available on the website.

Website links:

- https://industrial.omron.us/en/products/ny5-ai-controller
- https://industrial.omron.us/en/products/nx7-ai-controller

Competition

As of launch (Dec 2018), all competitors in the Americas are implementing Fog or Cloud level solutions. Defining "Edge" will be important, that the Omron solution resides within the customer machine itself and does not require any local PC (Fog) or remote server (Cloud) to operate. Also, it will be important to emphasize that the Omron solution automates Data Collection, Data Analysis, and Data Utilization, whereas others may not be able to effectively synchronize data-driven insights with the actual machine controls. The synchronization is important for accuracy of the machine learning results.

Traditional competitors

- Rockwell Automaton – using "FactoryTalk Analytics for Devices", customers must install this hardware Fog device into a network that allows EtherNet/IP connectivity to all related automation hardware to be monitored. The hardware device has very simple setup to seek out data from the networked devices, analyze the data for pre-determined insight, and then visualize it on an actionable dashboard. However this still relies on a person to interpret the visualization and act on it. There is no closed loop for the solution to programmatically change the operation of any system it is connected to – only achieving Data Collection & Analysis, not Utilization. Furthermore, like with other Rockwell Automation solutions, the hardware Fog device has a cost, as well as an annual software license to utilize it.

- Siemens – "MindSphere" is a large Cloud-based operating system which invites partners to create applications for its ecosystem that interpret the vast data into insights for users. This solution will require Cloud connectivity infrastructure, cybersecurity measures, and customized application development to achieve results relevant to a customer's machine and production, which will still miss some real-time issues due to network latency and aggregate analysis.

- Beckhoff – the "TwinCAT Analytics" Workbench and Service Tool can be implemented on TwinCAT3 compatible controller platforms, but still requires the customer to develop or sign-up for a Fog or Cloud based service to Collect and Analyze the data. This platform allows customers with Data Scientists already employed to leverage their existing analytics research, but will still come up against cost and complexity issues in implementation.

Software competitors

- There are many software companies trying to sell into the industrial space, based off of previous application in banking, retail, or building management, all implemented on Fog or Cloud. These solutions typically advertise as being hardware platform agnostic, which is true, but also means they are not responsible for the hardware durability in an industrial environment with continuous usage. Furthermore, most solutions do not take into account industrial "Real-Time" clock cycles where data can change in milliseconds, invisible to software platforms that will poll data from automation assets in 10-100 milliseconds. These systems were designed to discover anomalies in credit card transactions or HVAC operation costs, where data changed according to a human transaction or market price, not automated production. These solutions will require a lot of custom engineering, infrastructure investment, and likely trial-and-error to achieve value.

Stock and demo

As of launch (Dec 2018), stock has been ordered initially to supply Omron Field Engineers with hardware units for supporting customers and demonstrating the software utilities in proof-of-concepts. As the sales process will require prior application evaluation and project scheduling, stock will be re-evaluated for January 2019 based on Sales feedback and Advanced Order Notification requests. The planned traveling demo was delayed in production, but is expected to be completed in Q4 FY18

System configuration

Install a Web server if you want to transfer calculation results to a Web server.

Web server
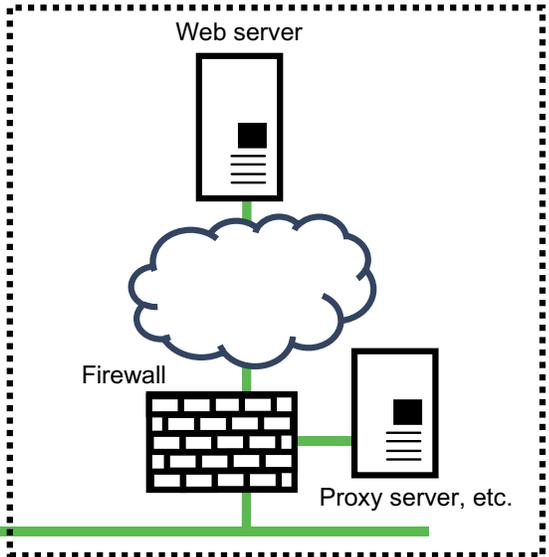
For NX-series
Install the AI Controller software utilities on the host computer

AI Controller software utilities

AI Operator   AI Viewer

EtherNet/IP

Firewall

Proxy server, etc.

For NY-series
AI Controller software utilities are pre-installed in Windows for the NY-series

NY-series   NX-series

AI Controller
· Time Series Database Function
· Feature Value/Machine Learning Function
· WebAPI Connection Function

AI Predictive Maintenance Library

EtherCAT

EtherCAT slaves

Related part numbers

Model name	Description
NY512-Z300-1XX214T1X	AI-C IPC, 16Axis, No panel, RS-232C
NY512-Z400-1XX214T1X	AI-C IPC, 32Axis, No panel, RS-232C
NY512-Z500-1XX214T1X	AI-C IPC, 64Axis, No panel, RS-232C
NY512-Z300-1XX214T2X	AI-C IPC, 16Axis, No panel, DVI
NY512-Z400-1XX214T2X	AI-C IPC, 32Axis, No panel, DVI
NY512-Z500-1XX214T2X	AI-C IPC, 64Axis, No panel, DVI
NY532-Z300-112214T10	AI-C IPC, 16Axis, Panel PC, RS-232C
NY532-Z400-112214T10	AI-C IPC, 32Axis, Panel PC, RS-232C
NY532-Z500-112214T10	AI-C IPC, 64Axis, Panel PC, RS-232C
NY532-Z300-112214T20	AI-C IPC, 16Axis, Panel PC, DVI
NY532-Z400-112214T20	AI-C IPC, 32Axis, Panel PC, DVI
NY532-Z500-112214T20	AI-C IPC, 64Axis, Panel PC, DVI
NX701-Z600	AI-C NX7 128axis
NX701-Z700	AI-C NX7 256Axis
AIC-STARTUPSUPPORT	Required multi-day Service includes group training on concepts, technology, and hands-on work to start data collection, feature extraction, model creation, AI Controller Predictive Maintenance Library installation, and utilization within machine controls program
AIC-RELEARNINGSUPPORT	Optional Service for re-training additional members after initial Startup Service, as well as assistance with feature extraction, model creation, and threshold setting with the AI Controller software utilities provided during Startup.
AIC-ANNUALSUBSCRIPTION	Registers the AI Controller as a customer asset and enable continuous use of software utilities to extract features, create models, and set thresholds. Also includes for download any and all new Sysmac Library and AI Application Components created by Omron throughout the subscription period.