

SUCCESS STORY

OPC UA THE DATA ENABLER AT PROCTER & GAMBLE



OPC UA deliver data for 115 brands of your daily life



Old Spice



Lenor



Downy



Gillette

NATIVE

Democratization of Data
Through the Use of
OPC UA Technology and
the Collaboration of All
Global Industry Partners
of Procter & Gamble

OPC UA deliver data
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NATIVE

AI AND MACHINE LEARNING OPC UA THE DATA ENABLER AT PROCTER & GAMBLE



Since its establishment in 1837, Procter & Gamble has been headquartered in Cincinnati, Ohio. The company's name originates from the founding fathers, the British William Procter (1801–1884) and his brother-in-law, the Irishman James Gamble (1803–1891). Today, the US consumer goods group operates 450 production sites in over 70 countries, and employs more than 100,000 people.

P&G is the 900th member of the OPC Foundation. P&G promotes smart manufacturing by driving the integration of digital technologies, including the OPC Unified Architecture (OPC UA).



MICHAEL CLARK,
Director North America
OPC Foundation

“Since its establishment almost two centuries ago, Procter & Gamble has successfully undergone many phases of innovation. With the integration of the global communication standard OPC UA, the group continues to demonstrate its leadership. As the 900th member of the OPC Foundation, Procter & Gamble becomes part of our collaborative digital communications ecosystem, made up of the world’s most future-oriented companies.”

THE FUTURE: DIGITALIZATION OF PRODUCTION AND TRANSFORMATION OF THE SUPPLY CHAIN

The aim of the entire digital transformation is to ensure the optimal supply of products and goods to customers, markets, and distribution centers worldwide. The supply chain should also be resilient, and able to adapt quickly to changing markets. In a nutshell: P&G wants to prepare and drive forward Product Supply 3.0 for the future. The aim is to use the proactive power of end-to-end integrated data to enable intelligent processes at the pro-

duction sites and distribution centers. According to Jeff Kent, Vice President, Smart Platforms Technology & Innovation at P&G, this ambitious step requires not only a standardized OPC architecture, but also close collaboration between all industry partners in the integration of OPC UA. The aim is to ensure that P&G generates the full potential of its investment in Industry 4.0, and succeeds in transforming product supply. For Jeff Kent, AI and machine learning are inextricably linked to the digitalization of production.



JEFF KENT
Vice President,
Smart Platforms Technology & Innovation at Procter & Gamble

“We’ve developed the SmartBox technology stack in collaboration with industrial automation partners to ensure consistent delivery of GPUs and IPCs for DevOps on the control edge. In addition, WISE serves as an end-to-end lifecycle, specifically supporting machine learning against required use cases. The underlying challenge here is the need for a network communications model that connects the sensors, controllers, the OT, and the cloud. It also needs to enable a bidirectional flow of information. We see no better way than to perform this through OPC Foundation’s introduction of OPC UA and its many different forms.”

P&G AND OPC UNIFIED ARCHITECTURE

INTEGRATED WORK SYSTEM (IWS) AT P&G

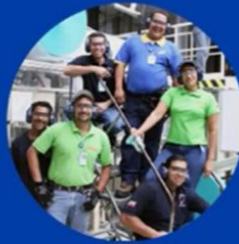
The consumer goods company Procter & Gamble and its manufacturing operations have been known for innovation in the consumer goods industry for many years. P&G developed its own program for operational precision and quality – the Integrated Work System (IWS) – many years ago. This system is used at over 100 production centers and 450 manufacturing plants worldwide. Current developments in the IWS focus on the integration of artificial intelligence and machine learning. This development is accompanied by the use of open standards. OPC UA is an integral part of the industrial communication frameworks in the automation systems at P&G. OPC UA offers secure data connectivity, from the sensor to the cloud.

SUPPLY CHAIN 3.0 STRATEGY INCREASING OPERATIONAL EFFICIENCY

Procter & Gamble is developing a Supply Chain 3.0 strategy for all company locations worldwide. This strategy aims to promote seamless data integration and connectivity. The objective: Machine learning and artificial intelligence. Specific goals include reducing operating costs in production and improving processes by 5 to 10 percent. Maintenance and repair costs, as well as quality assurance costs, are to be reduced by up to 50 percent. These goals are closely linked to the increase in operational efficiency at Procter & Gamble. The establishment of a coherent data model at the production and sales locations is logically of the utmost importance. For this reason, all processes and decisions are geared towards integrating well thought-out and practicable solutions at the sites. This applies to controllers, devices, the cloud and edge infrastructure as well as the servers on site. OPC UA is the key enabler for the new age of data at Procter & Gamble.

How to Win with Supply 3.0

Supply in Full



Superior Workforce

Seamless Data, Touchless Flow



Sustainability

P&G Touching Lives, Improving Life

FOUR CHALLENGES OVERCOME!

P&G STARTED ON THE PATH TO DIGITALIZING

production with AI and machine learning by establishing the basic strategic prerequisites.



- The data had to be democratized from the production facilities in an appropriate contextualization and resolution.



- A validated machine learning model needed to be developed to ensure the intake of the processed and transformed data.



- This model had to be integrated into the production environment, which also includes control systems, in order to carry out deterministic operations therein.



- The machine learning model was to be rolled out to all operating sites.

DATA ANALYSIS

WHICH DATA IS CRUCIAL FOR THE DIGITALIZATION OF PRODUCTION?

The focus of the digitalization projects lies on the generation, distribution, and networking of data. P&G focuses on three key aspects in relation to data:



- Data that is indispensable for smart processes.



- Data that makes the use of AI possible.



- Data required for machine learning.



“It is critical for P&G to have an innovation and operations ecosystem that enables the rapid value creation and sustainable operational excellence expected from smart manufacturing. We recognize the need to collaborate with automation industry partners and the OPC Foundation, as the leading global body for open communication and integration standards, to drive scalable, repeatable, and resilient implementations of smart operations technologies across our global operations. Smart manufacturing technology architectures, IT/OT network communications, data engineering and modeling, S/W applications, and AI/ML algorithms all depend on the proven, advanced, and practical application of the specifications we are introducing with our industry partners.”

JEFF KENT

Vice President,
Smart Platforms Technology & Innovation at Procter & Gamble

“Free the OT” in thousands of devices in over 100 location in more than 40 countries.

FREE THE OT

MODERNIZING THE OT

“FREE THE OT”

To enable data connectivity and make manufacturing processes more intelligent, Smart Platforms set itself the goal of modernizing operational technology (OT) in industrial environments. This also included sensors, actuators, control systems, and production machines, as well as complete systems. “Free the OT” was intended to remove restrictions in the OT in order to enable greater integration with information technology (IT). The result should be an improved networking of OT devices, more efficient data collection and analysis, as well as optimized automation and control. It was crucial that the control system played a very important role in the convergence of IT and OT. In order to implement thousands of machine learning algorithms at device level in over 100 locations in more than 40 countries, the control system had to be a very powerful asset. There are five key lessons to learn when freeing the OT. These lessons come together in a very effective way. By leveraging technologies, like OPC, and working together with industry partners, companies will be able to “Free the OT”. The following five lessons were learned from “Free the OT”.

CONTROL EDGE DEVICE = A COMPLETE COMPANY

Today, P&G has reached a level of maturity where a control edge device can operate as effectively as a full enterprise. In fact, some key suppliers and partners even prefer to work with a control edge device rather than an enterprise. This underlines the increasing importance and power of control edge devices in modern business environments. Along the way, the concepts of data connectivity and machine learning had to be combined. In order to create intelligent processes, a step towards simplification and cost efficiency had to be taken. This was the only way to introduce machine learning and AI. The introduction of AI and machine learning models to thousands of employees, with a particular focus on production facilities and the networking of machines and key work systems, such as quality assurance, maintenance, occupational safety, and material utilization, was an immense achievement.



STEFAN HOPPE
President and Executive Director of the OPC Foundation

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“Procter & Gamble is the manufacturer behind an incredible number of branded products that everyone likely knows and uses. It fills us with pride to see how Procter & Gamble is committed to capturing and utilizing critical data from a variety of automation assets, by consistently deploying OPC UA-enabled equipment across its various manufacturing sites.”



JEFF KENT
Vice President, Smart Platforms Technology & Innovation at Procter & Gamble

“I admit that I spent most of my 25-year career at P&G working my way up from the control system while I was involved in the creation of IT / OT convergence. We have now liberated the data from OT and automation. We want this data to flow into the reference architecture and be fully respected. Why? Because the data coming from the control system is part of a unified data model in the company, and should be able to deliver the performance of the control system. This is why we believe that ‘Free the OT’ means that we need to free the data from our operational technologies, which we usually think of as control systems, and ensure that the control system and its information technology can function with, or without, the entire company.”

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It is essential to understand and respect the control systems that are the source of the data. These control systems, from which the data originates, are the primary scope. They play a crucial role in operationalizing the data once the appropriate algorithms are created.



The concept of end-to-end data models encompasses a holistic approach to data management. Both the temporal dimension of the data, as it is available in time series, and its contextualization within the corporate context, are taken into account. This enables a holistic analysis and interpretation of the data that goes beyond isolated individual pieces of information.



The acquisition and processing of highspeed, low-latency data from sensors and control systems plays a crucial role in the development of algorithms that operate at the control system level. A deeper understanding of the dynamic processes and the amount of data required is essential to ensure that the algorithms can work accurately and effectively.

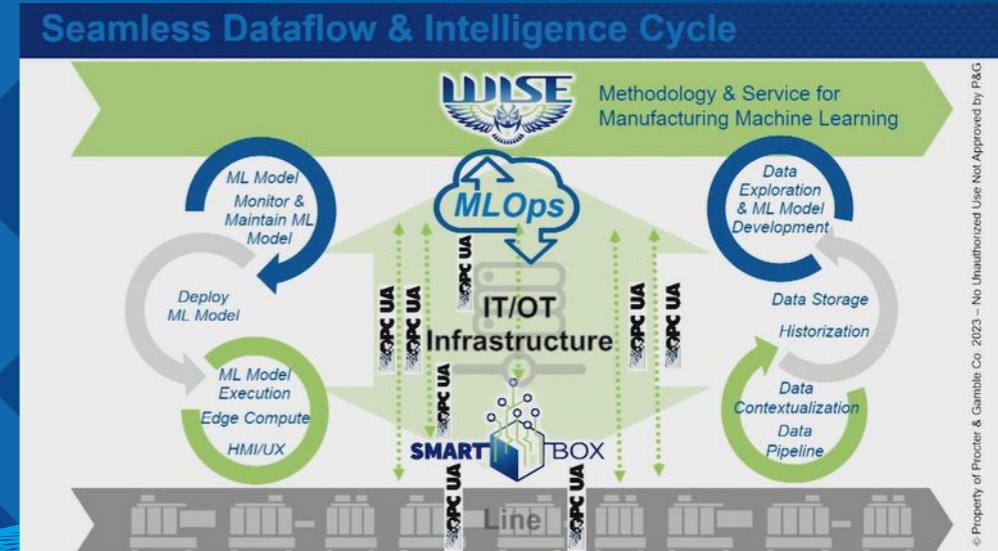
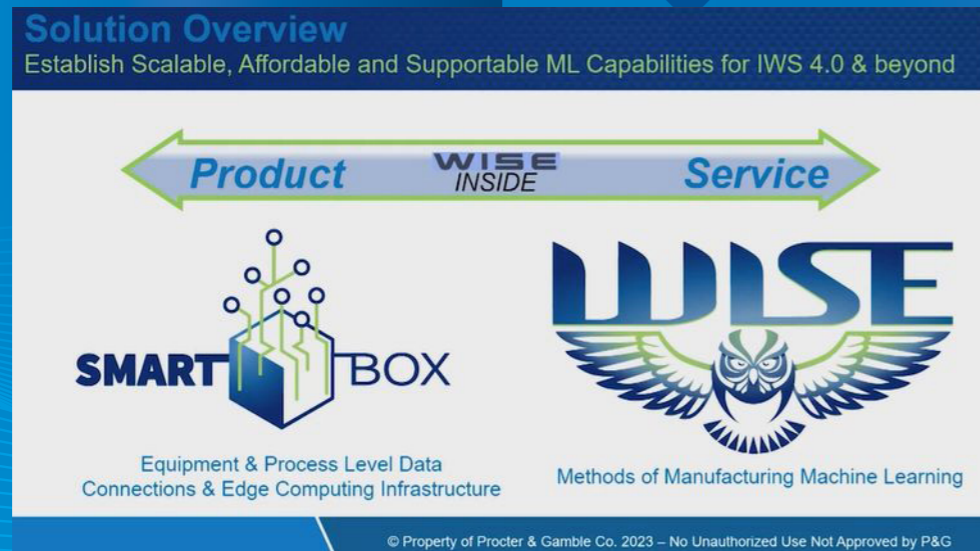


The implementation of the control edge and other technologies within the organization should therefore be done in a way that ensures that they are both integrated into the overall system, and can function independently. This requires careful planning and coordination to ensure that the different technologies work together seamlessly, while maintaining the autonomy of the control system.



A balanced enterprise architecture ensures that resources and investments are allocated according to the company’s specific requirements and priorities. This includes investing in industrial IoT capabilities at the device level to enable efficient data capture and processing directly at the source.

By combining both the SmartBox and the WISE service model, P&G has succeeded in significantly improving the democratization of data flow across sites.



SMARTBOX & WISE

SMART BOX

P&G has developed a technology stack at the control edge called the 'SmartBox'. The SmartBox edge device is used to facilitate interfacing and data harvesting from both new and existing controllers, as well as from OEM equipment, including interfaces to Mitsubishi, Rockwell, and Siemens. Data processing at the control edge holds significant importance due to the necessity for stringent coupling of algorithms responsible for implementing machine learning within the core operational procedures of P&G. This coupling mandates real-time integration with the control system, facilitating the execution of crucial functions like adaptive control. Data is transmitted through OPC UA to both the OT stack above and below the firewall, facilitating compatibility with cloud applications utilized by Microsoft. This dissemination of information throughout the enterprise expedites digitalization efforts and enhances efficiency, quality, and profitability. P&G manages the complete data cycle, encompassing

data acquisition, contextualization, model development, deployment, and the dissemination of insights to operators.

THE WISE INITIATIVE

P&G's WISE initiative is a service model. The concept was introduced as a codified approach to machine learning that enables all partners, especially in manufacturing, to comprehend their position within the process. It allows them to use machine learning operationally (MLOps) and thus support them in launching AI and ML initiatives. WISE constitutes a comprehensive framework providing support for both the DevOps operations associated with the SmartBox device, and the overarching machine learning (ML) lifecycle. OPC UA serves as the conduit for information flow, facilitating transitions across the stages of the machine learning cycle, extending from initial development to perpetual model maintenance in operational settings.



In 2023, Procter & Gamble became the 900th member of the OPC Foundation. Left to right: Stefan Hoppe, President & Executive Director, OPC Foundation; Jeff Kent, Vice President, Smart Platforms Technology & Innovation, P&G; Michael Clark, Director North America, OPC Foundation

COMBINING THE TWO CONCEPTS

By combining both the SmartBox and the WISE service model, P&G has succeeded in significantly improving the democratization of data flow across sites. The company is now able to develop and operationalize machine learning algorithms at the control edge or deploy them across the company's larger reference architecture. A unified approach for communication, data model, and integration throughout enterprise technology was therefore required. Among various methods such as APIs, P&G explored and implemented OPC UA and its extensions like OPC UA Field Exchange and OPC UA Time Sensitive Networking to align with industry standards and part-

ners. The result: OPC UA was deemed as the most effective unification approach, alongside P&G's proprietary APIs. It fostered a shared understanding with industry partners to meet current requirements and adapt to the evolving landscape encompassing devices, controllers, control edge, OT edges, and cloud infrastructure within the intelligent operations environment.



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