

OPC UA Series

Microsoft asked me to create three original posts based off of a **popular article** on how they use OPC UA standards in their industrial IOT strategy.

The result was the following three posts.

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David Young

Portfolio

How OPC UA Complements Our Open IIoT Approach

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Published article

The rise of Industry 4.0 has transformed the manufacturing industry, making it imperative to connect factories and plants with their disparate data sources to maintain a competitive edge.

Manufacturers can no longer be limited by proprietary technology and siloed data. To truly innovate, manufacturers know that every aspect of their operations—from the machines on their factory floor to the data in their on-prem databases and systems—must integrate and operate seamlessly. So when we first began developing Microsoft’s approach to industrial IoT (IIoT), we knew openness would be foundational.

For over two decades, we’ve relied on the **Open Platform Communications Unified Architecture (OPC UA)** standard to connect legacy equipment, systems, and data. We first partnered with the OPC Foundation in 1994 to begin developing a common set of standards manufacturers could use to break free of vendor constraints and siloes. This partnership has continued and taken on new urgency as more manufacturers leverage the cloud to connect, manage, and optimize their different solutions.

Although OPC UA is not a requirement for companies to use Microsoft products, it's an important factor for many that do, as well as a critical part of our openness approach. By aligning with this standard, we believe manufacturers can free themselves from vendor lock-in.

3 benefits of standardizing with OPC UA

For us, OPC UA is more than just a protocol. It is a concrete set of benefits we use to help customers transform their business processes and meet the needs of Industry 4.0 in three key ways:

- **Interoperability:** The ability to link different machines, systems, and entire factories is a requirement for modern manufacturers. This means helping customers break out of the "walled garden" approach that has defined the manufacturing industry for decades by building tools that make open communication possible between disparate technologies.

- **Data model standardization:** Thorough data analysis helps uncover new opportunities and efficiencies and create greater business value. We help manufacturers do this by not only linking their different technologies, but also standardizing the data models from those various sources. This allows them to incorporate telemetry from these data models into their business processes.
- **Security:** As manufacturers become more connected and generate more data, securing this information and its sources has become vital. This is especially important for physical machines, which may be vulnerable to tampering. By removing proprietary barriers and simplifying access, we help customers manage permissions, authenticate users, and encrypt data. This makes it easier for them to secure their entire system using redundant layers of defense mechanisms, a principle referred to as "defense in depth."

How OPC UA complements our openness strategy

In using OPC UA as a key component to guide our openness strategy, we give our customers a framework for creating more flexible, efficient, and sustainable business models.

Manufacturing data can remain relevant for decades, which means it can become an expensive liability. OPC UA solves this challenge through data standardization. By using open data formats and open-source tools, customers can “future proof” their data. This level of openness makes it possible for manufacturers to access data 40 years from now, even if the company that is responsible for the data now goes out of business in the future .

And because OPC UA is built on interoperability, manufacturers can easily break free of the obstacles set by proprietary technology. Their systems and information will all work together, regardless of their location or type. This makes it possible for manufacturers to manage all operations and view all

data through a single dashboard, allowing them to achieve new levels of connectivity.

These benefits create yet another advantage: With fewer dependencies, manufacturers are free to choose the tools and solutions that work best for them—not just those within the same ecosystem. This helps reduce costs, optimize business value, and increase competitiveness.

How Bühler is leveraging OPC UA

Bühler Group, a leader in food processing and die-casting technology, began using Azure IoT alongside the OPC UA standard to increase interoperability among its equipment and systems. Its customers manage a wide variety of products from several manufacturers, and Bühler wanted to give them control of everything through a unified platform. OPC UA provided Bühler’s customers with a universally compatible protocol that now allows them to connect and manage their equipment from a single point, improving information location, employee training, and productivity.

“The use of industry standards like OPC UA promotes interoperability between suppliers and enables them to work better together,” explains Robert Cuny, IoT program manager at Bühler. “It opens the door to develop solutions that drive efficiency across the entire value chain rather than a single machine.”

OPC UA is a powerful tool for helping manufacturers embrace more nimble, open strategies and transform their businesses for Industry 4.0. Learn more about [OPC UA](#) and how [Microsoft Manufacturing IoT](#) is using it to create additional value across the IIoT space.

How Our Open IIoT Approach Makes Manufacturers More Agile

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Published article

Even before we [introduced the Azure IoT Suite back in 2015](#), Microsoft was helping manufacturers realize the full business value of IoT. Backed by decades of experience in enterprise, we quickly became an innovator in industrial IoT (IIoT). Microsoft solutions have helped connect billions of different assets, process massive amounts of real-time data, and deploy AI to the edge. More recently, we became the first major cloud platform to offer end-to-end security using OPC UA—an accomplishment that has [made us a recognized leader in IIoT platforms for manufacturing](#).

Our commitment to openness has been key to this success, helping us stand out in the IIoT landscape. Every aspect of our IoT approach hinges on solutions that can be applied across different systems and data formats. Our focus on openness simplifies interoperability, allowing manufacturers to break free of the proprietary interfaces that have traditionally defined their industry and paving the way toward our customers' digital transformation.

Using open standards to increase flexibility

Openness has been a foundational strategy at Microsoft for years. In 1994, for example, we partnered with the OPC Foundation, which developed the Open Platform Communications Unified Architecture (OPC UA). This standard was the first significant step to helping manufacturers easily compare and analyze diverse datasets, regardless of vendor. Years later, with the emergence of cloud and IoT technology, we pioneered the use of the OPC UA standard to promote interoperability for cloud communication.

Even early on, we knew how important it would be for manufacturers to connect and communicate across disparate systems. That's why we've built support for the OPC UA standard into our full spectrum of IIoT solutions. This frees manufacturers to choose the equipment and tools that best fit their needs, knowing those solutions will integrate with our stack.

Our flexibility even extends to OPC UA itself. Although we recommend following its standard, it is not a requirement. All our IIoT services are open source.

Using open standards to unlock data and make smarter decisions

In the Industry 4.0 era, the ability to collect and analyze data across an organization is as important as using the most efficient machines and systems. But proprietary data formats can stand in the way, making it impossible to compare information across locations, hindering the ability to gain the business insights customers need.

Our solutions connect diverse platforms, then standardize the data into a common, open format. Suddenly, data across an organization can be compared, illuminating valuable new business opportunities or processes that lead to significant cost savings.

For manufacturers whose data may remain relevant and valuable for several decades, this capability is essential. Open standards allow them to not only access and analyze past data, but also makes them less vulnerable to change by enabling them to more easily adapt to future conditions. Because they don't

have to conform to legacy formats or systems, they can change equipment on the floor or upgrade their software solutions as their needs change—all without compromising access to past data.

Using open standards to build trust

We have also earned a reputation as a trusted IIoT partner that can develop secure and open cutting-edge solutions. Using the OPC UA Publish-Subscribe communication architecture, we convert all our customers' proprietary data into an open format prior to transferring it into the cloud. Microsoft is currently the only cloud vendor with this capability.

Features like this not only create business value, but are also secure. By increasing visibility across platforms and data streams—as well as giving manufacturers the ability to see their entire production line through a single dashboard—we simplify the process of managing access, authentication, validation, and encryption. Pair this with **the comprehensive efforts we put into IoT cybersecurity**, and customers have an ecosystem they

can consistently rely on for both innovation and protection.

Leveraging open standards with BMW

Our leadership in creating an open and interoperable IIoT platform for manufacturers and machine builders has inspired an alliance with BMW. Called the **Open Manufacturing Platform (OMP)**, the goal of this cross-industry initiative is to accelerate manufacturing innovation at scale by using an open approach to solve common problems. Completely cloud vendor-neutral, the OMP provides its members with specifications and sometimes even components for developing fully open-source smart factory solutions, production efficiencies, and new IIoT applications. The goal is to help more industrial organizations learn and benefit from open technologies while coming up with novel ways to solve industrial challenges.

“This is very good news for the manufacturing industry,” said Stefan Hoppe, president and CEO of the OPC Foundation. “For a long time, companies have promoted proprietary, closed ecosystems—the OMP

commitment to open development will shape tomorrow's manufacturing."

Our intense focus on openness has helped Microsoft become a leader in the IIoT field and ushered in today's era of smart manufacturing. Learn more about [OPC UA](#) and how [Microsoft Manufacturing IoT](#) is using it to create additional value across the IIoT space.

4 Ways We Drive Openness in Industrial IoT

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[Published article](#)

In a [previous post](#), we introduced the four components of our approach to openness in industrial IoT (IIoT). Although openness has long been a central concept for us—inspiring hundreds of products and services that can connect platforms and the seamless transfer of data between them—the specific ways we execute on this strategy have recently generated a lot of interest.

This makes sense. The increased need for smart manufacturing has spurred a digital transformation in the industry. To remain competitive, manufacturers must move beyond the proprietary systems that have defined their industry for decades and, instead, link together disparate technologies; correlate different data sets; and unify entire systems, factories, and enterprises.

In other words, they need to become more open.

Open standards

Open standards are fundamental to how we break down barriers to innovation, flexibility, and efficiency. By standardizing interfaces and information, we can promote interoperability in factories, throughout supply chains, and across entire enterprises. This creates complete visibility and frictionless communication, allowing manufacturers to more intelligently maximize business value.

A key focus area of our openness strategy is our support for the Open Platform Communications Unified Architecture (OPC UA) across Microsoft's IIoT services. A result of our decades-long partnership with the OPC Foundation, OPC UA is an open standard that manufacturers can adopt to make their devices, systems, and data fully interoperable. We have made significant contributions to extend OPC UA across the IIoT space and cloud.

In addition to making all Azure IIoT solutions compatible with OPC UA, we regularly help businesses deploy applications that are aligned with OPC UA standards, ensuring they will work across platforms. We also have leveraged our vast partner ecosystem to

develop solutions that help manufacturers adapt legacy hardware to OPC UA's open concepts. For instance, by using custom adapters that can standardize data at the intelligent edge, manufacturers can map their existing machines to open data models, making it possible to uncover new data and opportunities.

OPC UA is a powerful tool that has helped us promote open standards across the manufacturing space. However, our commitment to openness means not limiting customers in any way. That's why, as we extend OPC UA support to even more cloud technologies, such as analytics and AI-based anomaly detection, we will continue to let customers choose the standards that work best for them.

Open platform

The "best-of-breed" concept—the idea that businesses should let their customers use the best solution for the job—is a foundational part of our openness strategy. Preventing vendor lock-in was a critical reason behind our original partnership with the OPC

Foundation. It was also a goal when we created our Azure IIoT team and began expanding our software portfolio to the cloud. As a result, we've made support for open platforms central to our IIoT solutions and services.

Most notably, manufacturers have the freedom to mix and match our Azure products with the hardware and platforms that make the most sense for their business. For example, customers can employ custom IoT software and devices, then read that data and upload it to the cloud with their provider using Azure IoT Hub. And as business needs change and old solutions no longer fit, new solutions can easily be integrated without disrupting the entire system.

Unilever, a manufacturing giant that owns iconic brands like Dove and Vaseline, is leveraging Azure's open platform support to digitally transform its global supply chain. By using the Azure IoT platform to connect its industrial machines, Unilever is building a digital model of its factories, called a digital twin. This gives the company the visibility it needs to analyze its current processes, optimize outcomes, and

discover efficiencies—all while using its existing factory technology. As a result of Azure's open platform compatibility, the company has begun transferring some factory tasks to the more productive algorithms of its digital twin, ensuring it is maximizing production capacity and fully utilizing every asset.

Open source

Open source creates trust and gives long-term investment security, and our support for these solutions provides manufacturers with the flexibility they need to realize these benefits for their organizations. For instance, we publish all of our IIoT products publicly on our [Azure Industrial IoT GitHub page](#). This allows manufacturers to easily build out a custom system that will connect, monitor, and control IIoT devices according to the OPC UA standard.

And we continue to invest in developing open-source projects that add value for our customers. For example, Azure Kubernetes Service (AKS) makes it much easier to use Kubernetes, an open-source system

for deploying and managing containerized applications. By handling critical tasks like health monitoring and maintenance for you in Azure, AKS reduces the complexity and operational overhead of managing Kubernetes. In addition, this solution comes with features like accelerated application development, Visual Studio Code integration, and identity management through Azure Active Directory, showing what's possible when Microsoft applies its resources to the open-source field.

A prominent example of this is the digital transformation of **Maersk, the biggest container-shipping company in the world**. As part of this transformation, Maersk embraced open-source software to save more engineering resources and speed up development times. Because the Azure platform fully supports open-source applications, Maersk uses Azure to manage many of its tasks, including overseeing its dynamic application environment.

"Using Kubernetes on Azure satisfies our objectives for efficient software development," says Rasmus

Hald, head of Cloud Architecture at Maersk. "It aligns well with our digital plans and our choice of open-source solutions for specific programming languages."

Open data models

Maintaining easy access to data is especially important in the manufacturing industry, where information can remain relevant for years—even decades. So while open standards make it possible to pull data from disparate applications, open data models allow manufacturers to maintain access to valuable data in the cloud—as well as the insights it may contain—even when they switch cloud vendors.

To take full advantage of an interoperable environment, we've gone beyond standardizing hardware, software, and cloud applications to ensure that different data sets also can be easily accessed and analyzed. For instance, we are the only cloud vendor that is capable of automatically converting proprietary data into an open format as it is transferred to the cloud. No matter when data is

stored or what format it is in, this makes it possible—even easy—for anyone to access and analyze it later on. Because of this, we’re uniquely positioned to facilitate an open standard for telemetry data all the way into the cloud.

And we’re taking open data models a step further by leveraging a common data model that will provide a single, comprehensive view of every line of business. For example, [the Open Data Initiative](#), a joint collaboration between Microsoft, Adobe, and SAP, will eliminate costly data silos to generate deeper insights. Our goal is to help businesses realize the full potential of their data.

For many years, Microsoft has driven openness in the industrial space. This commitment translates into a comprehensive approach that has transformed how manufacturers connect their devices, systems, and applications to the cloud. As we move beyond the current era of digital transformation, we’re continually refining this strategy and applying it to other areas, such as the intelligent edge, to ensure

that innovation, flexibility, and efficiency remain cornerstone features of IIoT.

Learn more about how [Azure IoT for Manufacturing](#) can create additional value for your business.