

Intelligent Manufacturing made easy with Microsoft Azure



Introduction

Gain holistic operational insights with Intelligent Manufacturing

Intelligent Manufacturing has become the driving force of digital transformation. By integrating intelligent tools into their workflows, industry leaders such as AkzoNobel and Sandvik Coromant have achieved new levels of scale and innovation while greatly increasing production efficiency. Digital transformation in manufacturing requires companies to fundamentally alter their business model and operations. Manufacturers need to build their operations around a digital core and integrate their value chain as well as connect to the entire supply chain. A new digital core requires a truly open architecture to eliminate silos across industrial applications and proprietary vendor stacks throughout the entire value chain. Connectivity to existing equipment and production processes still remains a core blocker that can stall projects or lead to failure prior to value generation.

This whitepaper provides hands-on guidance on how manufacturers can implement cloud-native industrial solutions on Microsoft Azure. The approach is based on the adoptions of open standards to innovate and connect the dots between manufacturers' partners' systems and their own—within the well-proven requirements of the ISA-95 environment.

Simplifying the complex

The challenges of legacy proprietary systems are real and have greatly hindered innovation for manufacturers. This is particularly true because the implementation of remote monitoring and interoperability between systems in the new world will require them to closely integrate IT and OT systems, which gives them the opportunity to break down organizational silos. ISA-95 compliance will be paramount to ensure interoperability between systems. But these challenges shouldn't stand in the way of modernization and growth for any manufacturing sector—especially when they combine those compliance standards with Intelligent Manufacturing tools to bring greater visibility across their enterprise and allow them to scale more quickly. When manufacturers integrate the right technologies into existing industrial platforms, they can truly unlock the value of Intelligent Manufacturing at scale and free themselves from proprietary systems that slow innovation.



When Dutch paint and coating company AkzoNobel decided to pilot a digital performance portal program in one of its factories, this truly was a transformation—employees had been using pen and paper to monitor their equipment—employees ticked boxes every 15 minutes to indicate their machines' performance. By adopting Microsoft Azure and Industrial Internet of Things (IIoT) solutions, these game-changing technologies have made system data available to everyone on the line who needs access, greatly increased efficiency and productivity from management to the factory floor, and enabled the company to compare performance in multiple factories. Overall Equipment Effectiveness (OEE), with real-time data, is now the key metric to measure the productivity and performance of the machines used in the production of their paint products.

"With this new system, we can check on the performance of the factory in real time," says Giuseppe Rigamonti, Site Manager at AkzoNobel Como. "Whether it's at home, on a laptop, on a phone, we can check exactly what is happening. In the past, we were in control one day after—now we are in control every second."

The right IIoT strategy will reduce the effort to link multiple technologies together. Manufacturers can correlate entire data sets and systems across production facilities and business areas. Those correlations connect industrial equipment, extract operational data from machinery, and turn that data into actionable insights both on the factory floor and across the supply chain.

Azure IIoT is entirely built around a single principle: Any solution must interoperate with disparate systems and data formats, which removes the data silos that increase complexity and hinder manufacturers' ability to digitally scale their operations. This concept of openness *simplifies* interoperability and allows new IIoT solutions to scale as well as manage dependencies on specific vendors.

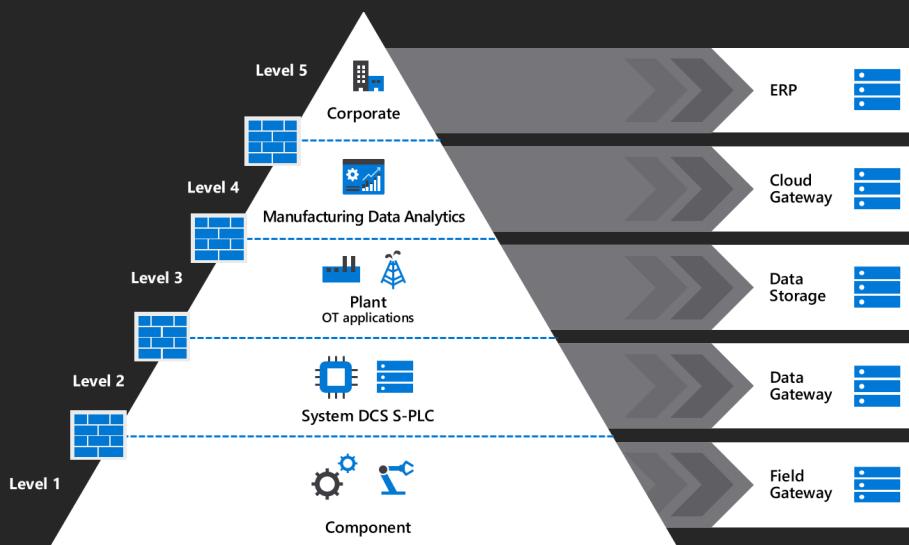
Manufacturers can take a vendor-agnostic approach to finally remove the traditional proprietary interfaces that have shaped their industry and slowed innovation throughout the sector.

Capitalizing on the promise of Intelligent Manufacturing

International standards such as ISA-95 dictate strict models to ensure security, transparency, and smooth communications in the automation pyramid. Standards allow for interoperability along the supply chain and within an organization itself in a secure and compliant way. But when a manufacturer wants to remove the obstacles that stand in the way of innovation, agility, and efficiency, standardization is only a prerequisite. ISA-95 plays a critical role, but true competitive advantage means creating an environment that removes dependencies on protocols yet keeps systems secure.

ISA-95's strict pyramid model separates the levels of manufacturing operations with a protective firewall to heighten security standards. Only directly neighboring levels can communicate with each other, and only the uppermost layer of the pyramid can access the internet. The most critical plant control systems, meanwhile, sit at the bottom of the pyramid.

The objectives of ISA-95 are to provide consistent terminology that sets a foundation for supplier and manufacturer communications, and to provide consistent operations models as a basis to clarify application functionality and how information will be used.



But these standards create limitations within the organization when communication needs to occur among separate levels. However, by overlaying NAMUR open architecture (NOA), the most flexible communications model, on top of what currently exists, manufacturers can adopt a best-in-breed standard and take advantage of a flexible protocol that provides the most opportunities for a future common model. Microsoft recommends NOA to its customers due to the greater simplicity it offers that allows manufacturers to pilot new projects while preserving the integrity and safety of their existing systems. This framework gives manufacturers the security of ISA-95, but doesn't impact current working models or vendor relationships. It also enables their bottom-level communications to flow more freely up the pyramid. Manufacturers can then implement innovative solutions at high speed where an inflexible scaffolding between layers would have otherwise been blocked.

While ISA-95 has provided immense value for manufacturers, NOA attaches a variety of Intelligent Manufacturing use cases that can significantly increase operational efficiency and promote innovation. With NOA, the OPC UA open interface's built-in model handles data flow, then contextualizes that data between the existing core process control domain and the monitoring and optimization domains. The metadata this flow process generates gives manufacturers further options to innovate.

Building a robust, secure and scalable industrial platform with Microsoft Azure

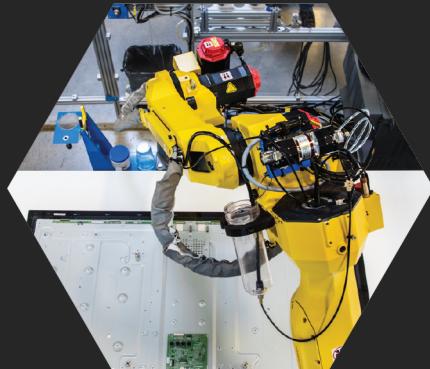
Microsoft Azure has been leading the way in developing powerful solutions for manufacturers. Our deep commitment to open platforms and protocols like OPC UA or NOA architecture accelerates the path to innovation at scale and reduces complexity, cost, and implementation time. By using tools like Microsoft's Nested Edge, manufacturers can maintain ISA-95 compliance without having to build their own networking isolation stack. They no longer need to be limited—and defined by—rigidity and complexity. Instead, Microsoft works with manufacturers to unlock the untapped potential of their processes. The openness this potential creates within a platform brings manufacturers security and scale. Just as important, however, is the simplified communications structure that speeds up their time to market and reduces their manufacturing costs.

Nested Edge provides manufacturers a path to meet ISA-95 requirements for mission critical processing control data. This feature, unique to Microsoft Azure customers, gives manufacturers the ability to seamlessly deploy edge computing throughout the automation pyramid without compromising their existing technologies, such as:

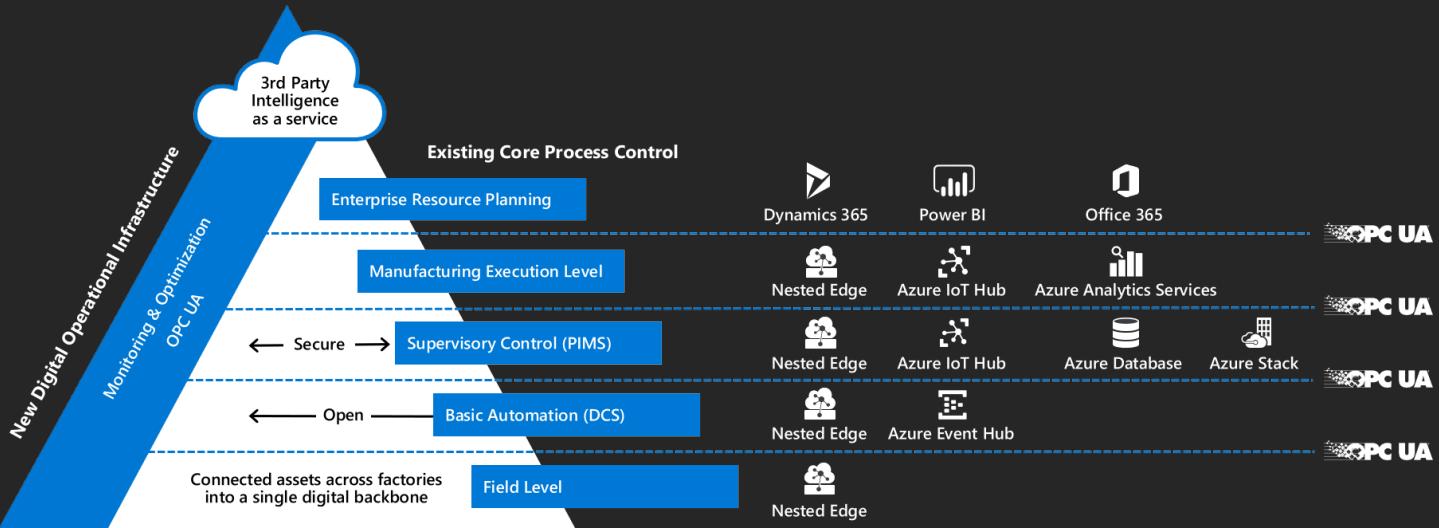
- Deploy chained edge gateways on the various layers of the automation pyramid while adhering to the security and compliance standards mandated by ISA-95.
- Securely collect and aggregate telemetry from each network layer to gain real-time data about production process.
- Use the full benefits of edge computing to reduce unplanned downtime and simplify the insights that bridge industrial solutions and a plant's manufacturing process.

Azure's **comprehensive service portfolio** addresses the unique needs of industrial organizations by extracting, integrating, storing, and analyzing the massive volumes of data used to generate operational insights at an exceptionally large scale.

- Collect, store, and analyze data through a broad service portfolio that capably addresses the nuances of a specific Intelligent Manufacturing implementation.
- Utilize a manufacturer's existing assets on a single digital backbone to offer seamless integration with Azure, Microsoft 365, Dynamics 365, and Power BI through a common data model.
- Build necessary solutions without having to overcome unnecessary complexities often associated with breaking down data silos.



The diagram below shows how an OPC UA overlay onto the ISA-95 pyramid opens communications capabilities and how different analytics and data tools in the Microsoft portfolio align to each level.



As Swedish tooling and machining manufacturer Sandvik Coromant moved to further digitize its own factories, they turned to Microsoft Azure to help them implement their cloud strategy. With their migration to cloud-based ERP and process-control tools, this collaboration has led to an average 40 percent increase in engineering and operator productivity. At the same time, this transformation has enabled Sandvik Coromant to share its learnings with its own customers.

Optimize OEE with Microsoft partner solutions on Azure

Many manufacturers that successfully implement Microsoft's Intelligent Manufacturing solutions do so with help from our partner network. Partners such as Siemens, ABB, PTC, and many others work with Microsoft to use these industrial cloud and edge offerings into their industrial solutions. Our partner network features many organizations with deep levels of manufacturing expertise. We recommend that manufacturers identify their pilot use cases, then decide which industrial solution works best for them. Using this approach can significantly reduce implementation costs and risk while increasing any manufacturer's potential for transformative innovation.

As manufacturers begin their cloud transformation, they must weigh the inherent challenges of building their own cloud implementations against investing in a pre-built platform. The high bar of designing and deploying a solution of its own could cost a manufacturer years of competitive advantage and pull the company's best people away from their core competencies. By opting for a pre-built solution from one of our leading industrial partners, manufacturers experience a much faster time to value while guaranteeing a system that's always running and always up to date.

By working with Microsoft technology to build their industrial platform, manufacturers will benefit from the extensibility of our manufacturing partner ecosystem as well as the principles of openness and system interoperability. They will also gain access to over 2,000 applications listed on [Microsoft AppSource](#) that our leading ISVs have built on Azure. Manufacturers can also use our partnerships with Global SI organizations fluent in our approach and extend our principles to implementation. We believe manufacturing companies should not manage their transformations alone—they can rely upon our partner ecosystem to catalyze their success on whichever level of the pyramid below best suits their needs.

L5: Facility Planning (buy, sell), Cash Management, Product Management, Asset Management



Dynamics 365 partner ecosystem

L4: Plant Production Scheduling, Operational Management



L3: Dispatching & Detailed Production, Scheduling, Reliability Assurance



L1 & L2: Batch Control, Continues Control, Discrete Control



Microsoft, in collaboration with our many partners, provides a robust product strategy that meets the manufacturing sector's unique needs of scalability, repeatability, security, and openness to help our customers increase ROI and efficiency. Just as important, we help manufacturers maintain compliance with industry standards while removing the barriers that stand in the way of their Intelligent Manufacturing implementation at scale. Manufacturing organizations have the power to utilize the technology they choose—including but not limited to the Azure portfolio—while eliminating concerns about whether it integrates with the Azure technology stack.

Conclusion

As remote operations become a more visible part of our working environment, digital transformation in the manufacturing sector is only accelerating. Industrial organizations need partners to help reduce their costs, increase efficiency, and innovate across their operations with Intelligent Manufacturing solutions. When implementing a scale-ready industrial platform flexible enough to address their operational needs, modern manufacturers must work with a technology provider that possesses a deep understanding of this paradigm.

Microsoft Azure offers the most reliable and quickest path to success. We've based our approach to manufacturing on the belief that our customers and partners benefit when we can increase their speed to market, reduce their materials costs and their capital/operations expenditures, and help them unlock the value from their data. Our product strategy, supported by a comprehensive product portfolio, spans the intelligent edge and intelligent cloud, capable of meeting manufacturers' scalability needs; our industry-leading partner ecosystem and a foundational commitment to security and open standards are pillars that can support their path to Intelligent Manufacturing. But don't take our word for it. Read these [stories](#) of manufacturing organizations that have chosen to work with Azure to accelerate their Industry 4.0 transformation journey.

What comes next

To begin modernizing your manufacturing operations:

- Understand your own position by looking at the [Azure Industrial IoT documentation](#) and [GitHub Repository](#)
- Try Azure and many of the tools available with membership by starting a [free trial](#)
- Contact the [Azure sales teams](#) to learn more about our approach to manufacturing

Get started today!