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MARKET INSIGHTS FOR THE INTERNET OF THINGS

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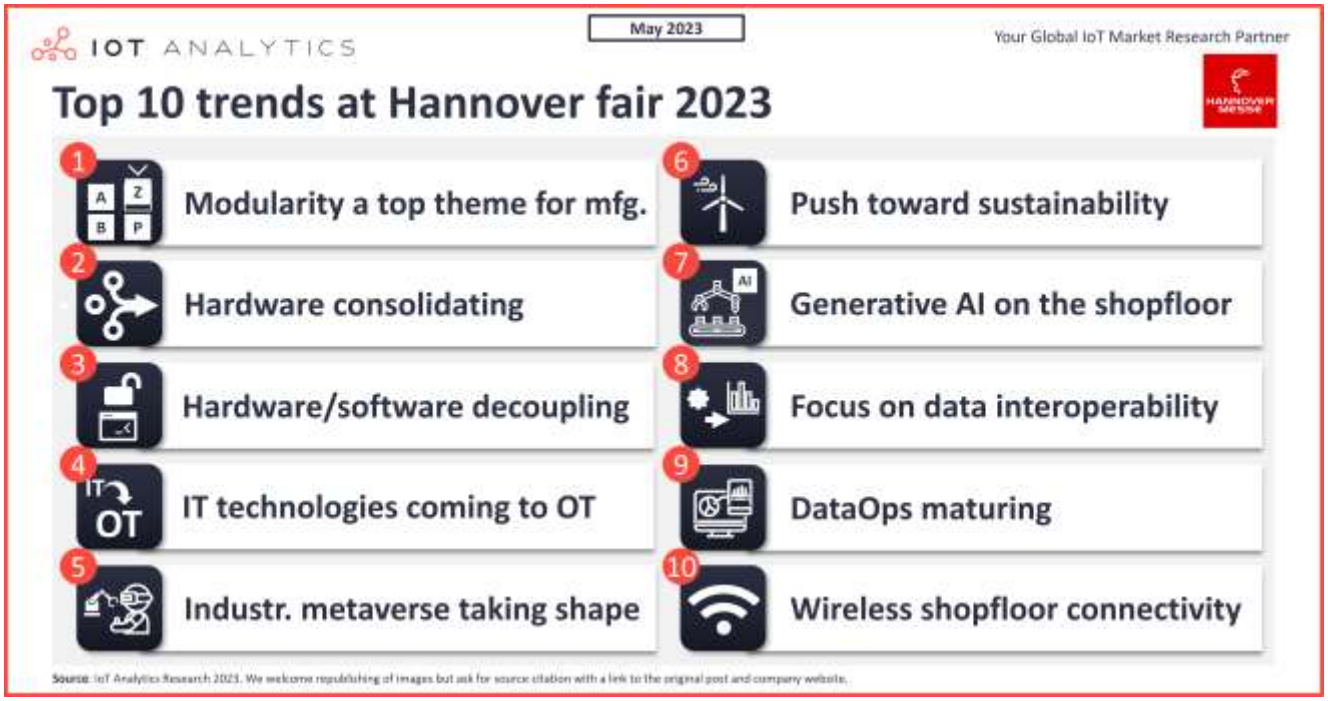
INSIGHTS RELEASE

The top 10 industrial technology trends—as showcased at Hannover Messe 2023



Hamburg/Germany, May 17, 2023: IoT Analytics, a leading global provider of market insights and strategic business intelligence for the Internet of Things (IoT), AI, Cloud, Edge, and Industry 4.0, today published a 109-page Hannover Messe 2023 event report, including a summary of the 10 key highlights of the fair and 32 in-depth insights assembled by the IoT Analytics analyst team. This article details the 10 key trends observed.

Key insights:

- **Hannover Messe 2023** showcased the latest industrial technology trends. Highlights included industrial companies leveraging more IT tools, the decoupling of hardware and software, and factories becoming more modular.
- The fair also witnessed interesting implementations of the industrial metaverse, CO2 tracking, and generative AI.
- IoT Analytics published a **109-page event report** with plenty of insights from the fair. The team also shared some of their highlights in **this** video.

Key quotes:

Knud Lasse Lueth, CEO at IoT Analytics, comments: "*The Hannover Messe 2023 confirmed that the move toward software, cloud, AI, wireless, and a bigger solutions and IT technology focus is intensifying. The pace of innovation around industrial technology is high and the fair highlighted that some are faster to market and more strategic than others as they bring out new technologies.*"

Hannover Messe 2023

Hannover Messe (or Hannover Fair), the number one global industrial tradeshow, was back in action a few weeks ago. The event, which took place from 17–21 April 2023, in Hannover, Germany, showcased once again the latest developments and industrial technology trends. Although attendance was still below pre-pandemic levels (130,000 visitors—roughly 40% below 2019 levels), the fair grounds were buzzing and filled with senior executives from many of the leading industrial hardware, software, and service providers. The conference remains one of those rare fairs where you randomly walk into senior executives, like a head of engineering for a major industrial conglomerate, and not only the pre-sales representatives giving you the usual pitch.

"More than 4,000 exhibitors presented their solutions for a digital, networked, and sustainable industry… including high-end products for climate-neutral production, new hydrogen technologies, inspirational impulses from start-ups for networked production processes, robots that can be operated by voice using AI, solutions for efficient energy management, and the start of the new data ecosystem Manufacturing-X."
Dr. Jochen Köckler, Chairman at Deutsche Messe

IoT Analytics had 16 team members on the ground to uncover the latest industrial technology trends. In total, our team visited more than 300 booths, conducted over 200 individual interviews, and attended a number of presentations to get a handle on how digital is impacting manufacturing in times of a looming recession.

This article highlights 10 of the major takeaways from our team; our research clients can refer to the 109-page "Hannover Messe 2023—the Latest Industrial IoT/Industry 4.0 Trends" event report for a much more in-depth discussion of 32 insights, including individual company exhibitions with examples, vendor comparisons, and important quotes.

Top 10 industrial technology trends at HMI 2023

In our report, we detail a total of 32 insights that we uncovered at the fair. In this article, we highlight our opinion of the 10 main trends we observed (without going into detail, but mentioning key exhibits).

1. Modularity is becoming the top theme for future manufacturing

The COVID-19 pandemic and the supply shock aftermath showed manufacturers how important it is to be adaptive (e.g., change the supply chain setup or factory layout quickly in the face of a different demand pattern, or integrate the only hardware that is available during a supply crunch). As a result, almost all exhibitors somehow highlighted the need for modularity and interchangeability.

- **SmartFactoryKL:** This was particularly notable as part of all "future factory" showcases (e.g., compared to 2022, SmartFactoryKL added the Asset Administrative Shell (AAS) and the Eclipse Dataspace Connector (EDC) to its factory showcase to increase flexibility and modularity).
- **Siemens:** At the fair, Siemens launched its new "Industrial Operations X" portfolio, allowing users to seamlessly combine a number of hardware and software components, thereby promising to "make OT adaptable at the speed of software."
- **Fraunhofer:** Fraunhofer Institute showcased its lighthouse project "SWAP-IT architecture," which aims to propose a modular production architecture for a scalable cyber-physical production system that can be flexibly applied to a wide variety of production processes.

SmartFactoryKL's demonstration included the _KUBA and CIPRA workstations which are part of the Production Level 4 ecosystem. (Source: IoT Analytics)

2. Hardware platforms are consolidating

The lines between PLCs, IPCs, gateways, and other hardware devices are further fading as powerful multi-purpose chips such as the new **Intel** 13th gen Raptorlake CPUs become the go-to compute platform across devices. At the same time, hardware devices become smaller while integrating more functionality inside that separate devices (e.g., I/O master functionality) used to be handle. Another notable, recent change is the addition of AI acceleration across the hardware stack so that companies can run AI interference (mostly for vision use cases at this point).

- **Beckhoff:** At the fair, Beckhoff highlighted its latest lineup of C60xx IPCs, which are considerably smaller than the previous generation. In particular, Beckhoff highlighted its new C6043-0090 series IPC with built-in AI accelerator (**NVIDIA** RTX A4500 GPU)**.**
- **CoreTigo:** CoreTigo showcased its TigoGateway1TE, which hosts an I/O module master, allowing field devices to connect directly to the gateway wirelessly via IO-Link wireless without the need for further hardware.

CoreTigo showcased its TigoGateway 1TE, embedded with an I/O master. (Source: CoreTigo)

3. Decoupling of hardware and software is gaining momentum

To the surprise of many at the fair, the world's leading industrial automation vendor **Siemens** announced a "virtual PLC" software offering that is completely decoupled from proprietary hardware. This announcement marks a paradigm shift for industrial automation as it allows Siemens control software to basically run on any third-party (standard) hardware. Siemens is not the first to announce such an offering (e.g., **Schneider Electric, BoschRexroth, Beckhoff**, and **Codesys** have done so before), but it shows that the market leader is further opening up and getting ready for a truly software-defined automation stack.

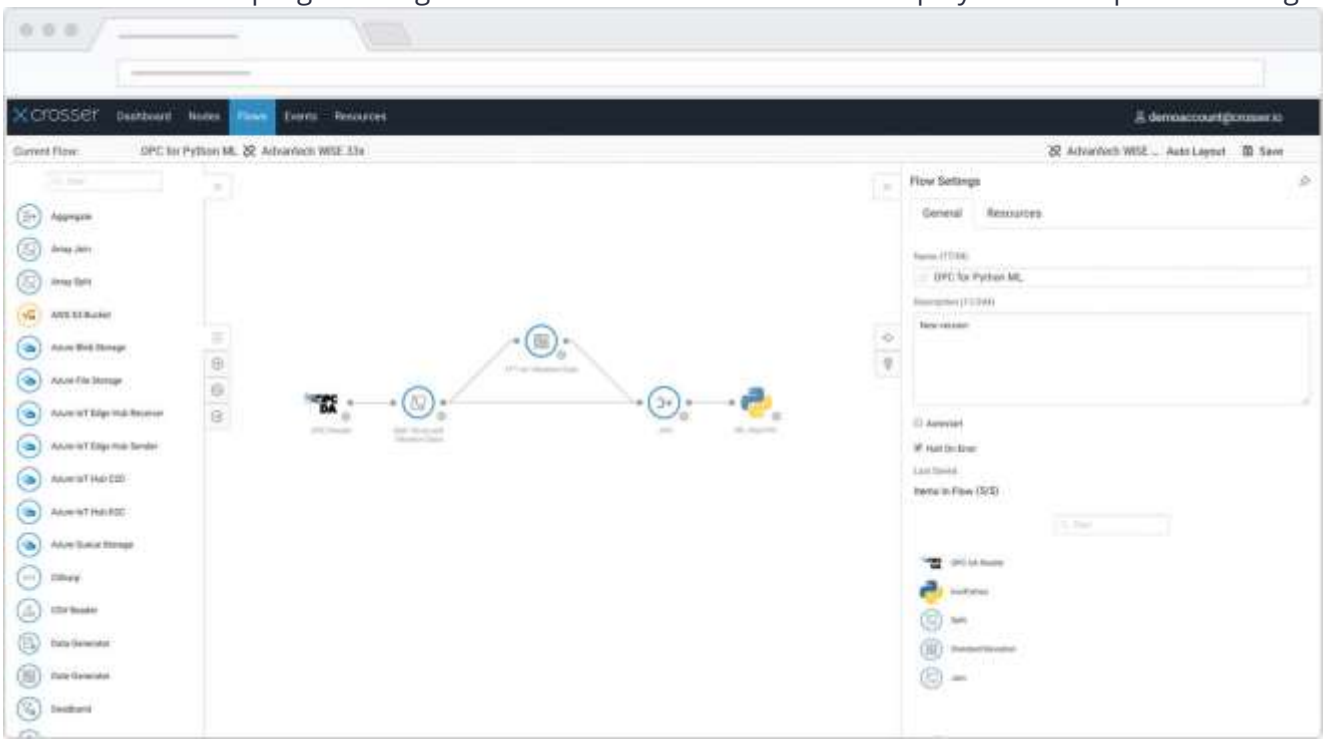
- **Audi**: At the fair, Audi highlighted how it is now working with Siemens to make virtual PLCs a reality in its plants in the coming years (covered in more detail in our report in insight #19).
- **Intel, VMware:** Intel and VMware discussed how they optimize the underlying infrastructure so that, in the future, virtual PLCs can handle sub-1 millisecond cycle time and be used in a safety setup.

4. More and more IT technologies are coming to OT

There is a push toward using an IT-style approach (e.g., low-code, integrated development environments and containerization) to configure/engineer/deploy OT applications and control logic.

- **Schneider Electric:** Schneider Electric showed how its EcoStruxure Automation Expert takes an event-driven, decentralized, and open approach to automation engineering with IEC 61499 at its core.

- **Beckhoff, Phoenix Contact:** Beckhoff and Phoenix Contact continued highlighting their Microsoft Visual Studio-based engineering environments.
- **Siemens:** Siemens showed how its new Industrial Operations X brings IT software methodology to engineers who deploy OT applications.
- **Litmus Automation, Crosser:** Litmus Automation and Crosser showcased how they allow for the creation of custom flows of data from source to applications via Node-RED or similar low-code visual programming tools. The flows can then be mass deployed to multiple nodes/edge.



Crosser's offering includes a library of modules and connectors that enable the user to build custom data flows via the user interface. (Source: Crosser)

5. The industrial metaverse is starting to take shape

HMI 2023 saw a revival of the "industrial metaverse." While it had become quiet regarding the usage of the term leading up to the fair, a number of companies presented their vision of the industrial metaverse, including **Microsoft**, **Siemens**, **CapGemini**, **SAP**, and **Schneider Electric**. We noted that the visions were clearly not aligned, with some putting augmented/virtual reality (AR/VR) into the center, whereas others clearly excluded AR/VR. In all cases, the industrial metaverse was, to a large degree, a new marketing term for an existing set of technologies. The most common denominator was the fact that digital twins played a key role for all companies, with some saying that the industrial metaverse is the next step in that journey.

Microsoft demonstrated its Hololens technology together with German EV car maker e-go. (Source: e-go)

6. There is a strong push toward sustainability

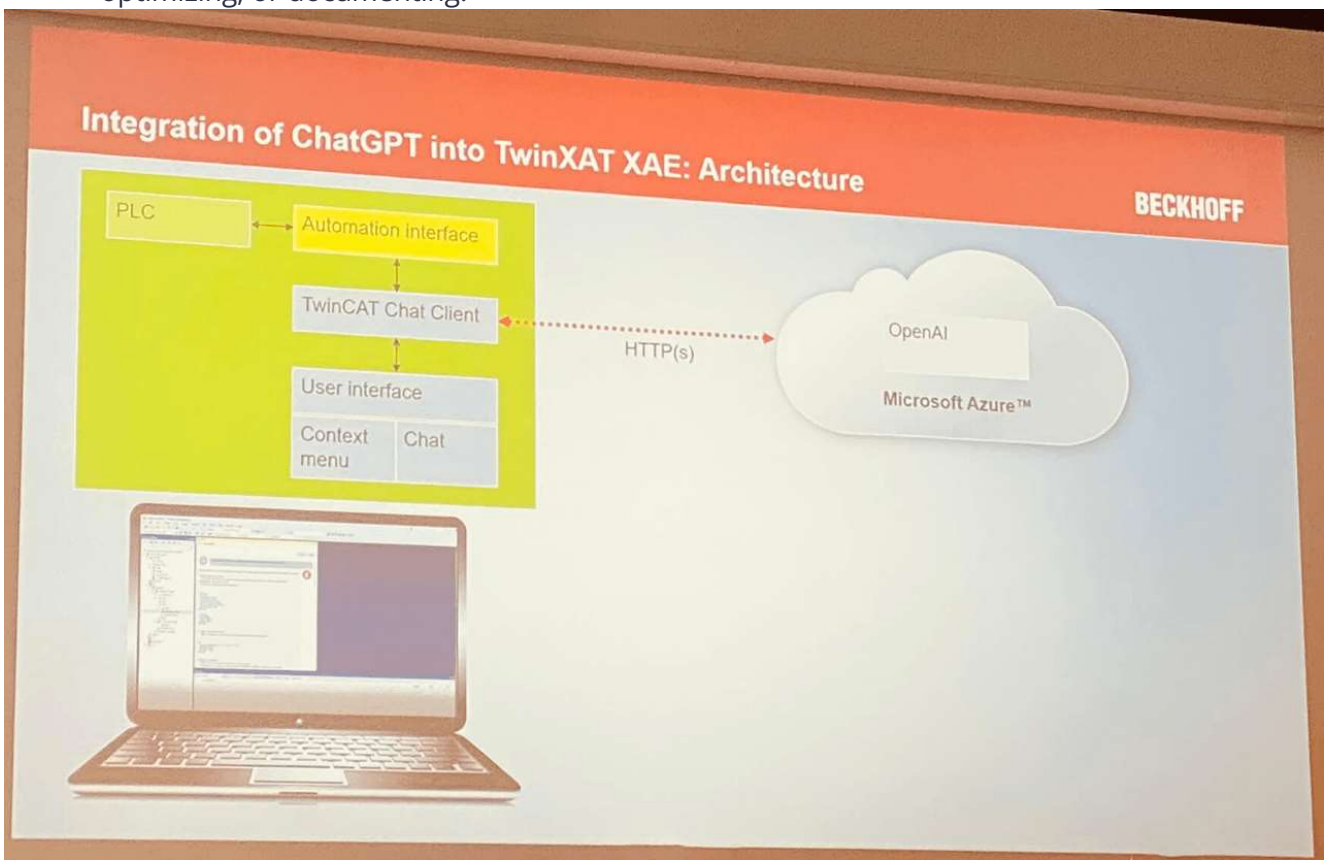
At last year's Hannover Messe (2022), we highlighted how sustainability had entered the fair as a key theme. This year, we noticed a lot more "meat to the bone." We came across a considerable number of solutions to help companies track their carbon footprint, driven in part by new ESG regulations such as the Corporate Sustainability Reporting Directive (CSRD).

- **Siemens:** Siemens presented its SiGREEN Solution, a software tool that allows manufacturers to track the carbon footprint of products across the whole supply chain.
- **Microsoft:** Microsoft demonstrated its Sustainability Manager, which is part of its Microsoft Cloud for Sustainability offering.
- **Cisco**: Sustainability is also becoming a key sourcing criteria. Cisco, for example, highlighted how the inclusion of ESG criteria is becoming commonplace in both public and private tenders, locking out suppliers that do not fulfil the requirements or fail to be transparent about it.

7. Generative AI is being implemented in manufacturing

With generative AI unarguably the #1 buzz in tech right now, the first applications in manufacturing were visible at the fair.

- **HPE:** HPE and Aleph Alpha showcased an industrial AI assistant that communicates with factory personnel through voice control and images.
- **Beckhoff:** Beckhoff highlighted how ChatGPT had already been rolled-out to its TwinCaT software to allow users to generate control logic code.
- **Siemens:** Siemens showcased an upcoming integration of ChatGPT in TiaPortal V18, allowing users to get assistance not only when producing PLC code but also when debugging, optimizing, or documenting.



Beckhoff presented an integration of ChatGPT into its TwinCAT software. (Source: IoT Analytics)

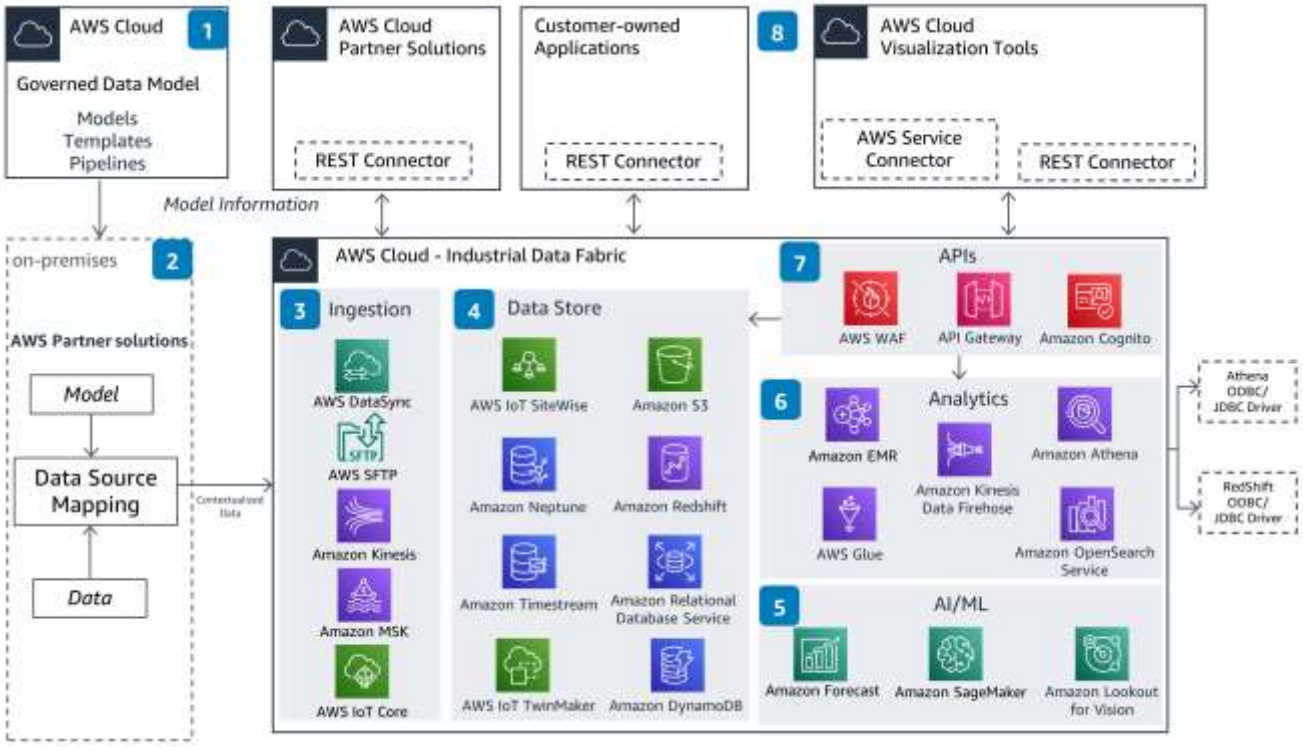
8. Interoperability focus is shifting from assets to data

Discussions at the fair showed how specific asset connectivity technologies such as OPC-UA, IO-Link, or MQTT have become or are in the process of becoming global interoperability standards. With such standards establishing themselves, at the same time as AI and data are taking a much bigger role in many digital transformation initiatives, the focus is shifting away from standards to connect assets toward data format standards and architectures.

- **AWS**: At the fair, AWS introduced the Industrial Data Fabric (IDF), which includes an Open Industrial Data Architecture that enables best design practices for storage and easy accessibility of industrial data.

- **Google:** Google highlighted improvements to its Manufacturing Data Engine, which is a core offering for manufacturers that not only allows one to acquire data from various types of machines but also comes with built-in data normalization and context-enrichment services.
- **Microsoft:** Microsoft highlighted how the Azure cloud enables automotive suppliers and OEMs to share data via **Catena-X**, an open data ecosystem for the automotive industry that links global players into end-to-end value chains.
- **OPC Foundation**: Meanwhile, the OPC Foundation stressed its expansion to the energy sector and its new initiative to standardize REST interfaces for OPC-UA to simplify information exchange.

We also noted that more vendors were aligning behind "Asset Administration Shell" (**AAS),** which aims to define a standardized digital representation for any asset.



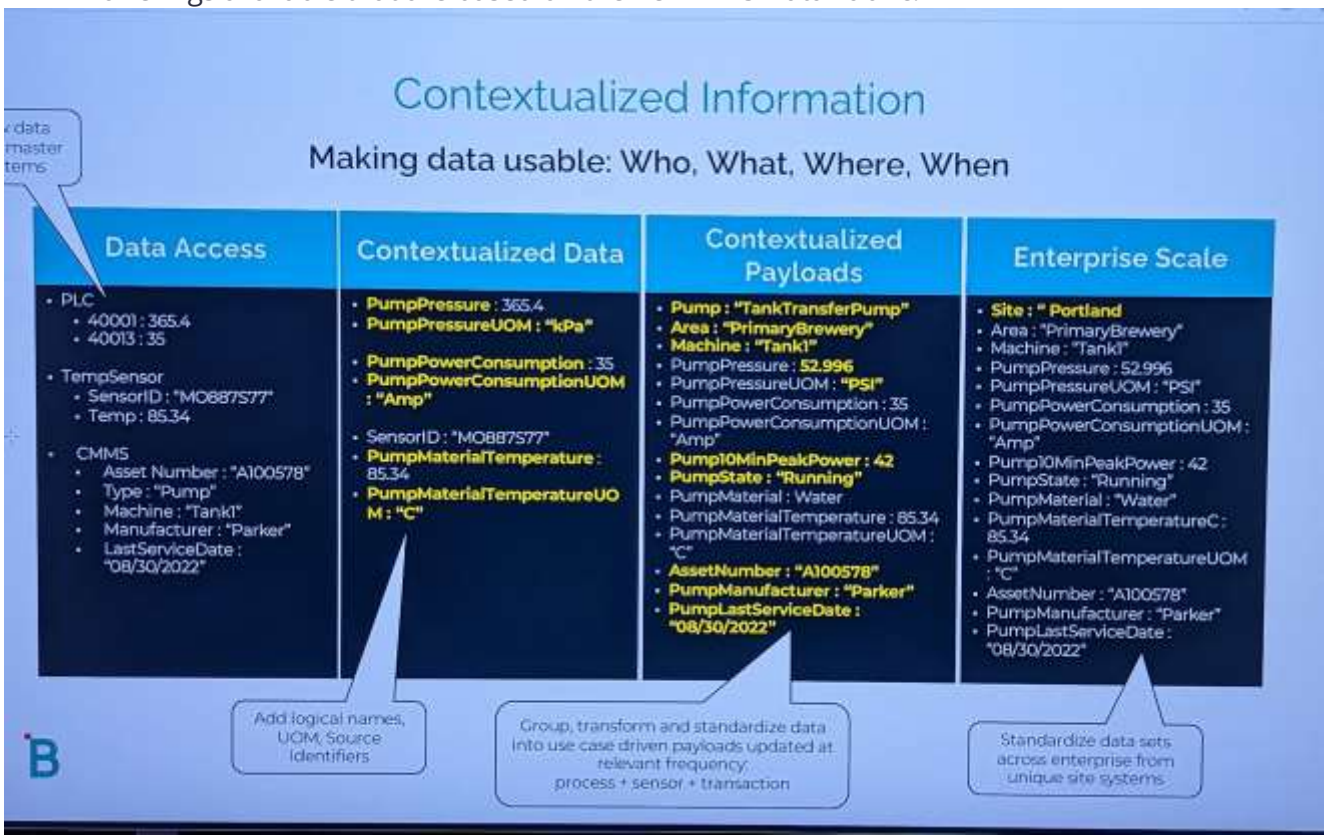
AWS showcased the Industrial Data Fabric architecture. (Source: AWS)

9. DataOps is maturing

Making data interoperable is one side of the coin, whereas ensuring manageability in day-to-day operations is the other. Therefore, unsurprisingly, we noted a lot of interest for vendors (often start-ups/scale-ups) that promised to manage and optimize OT data streams. These vendors target the severe need for high-quality data without spending too much time on preparing/cleaning the data.

- **Cognite:** Cognite showcased updates to its data operations platform, Cognite Data Fusion (CDF), which aggregates, cleans, and contextualizes real-time and historical data from OT, IT, and ET (engineering tools).

- **Rockwell Automation:** Automation vendor Rockwell Automation highlighted its strategic partnership with Cognite that integrates FactoryTalk DataMosaix with Cognite's CDF to make operational, engineering, and enterprise data inside the Rockwell ecosystem more understandable**.** Founded in 2018.
- **HighByte:** HighByte showcased its Intelligence Hub, which helps to connect, model, condition, and flow industrial data to and from IT systems in a web-based, code-less, and edge-native fashion. HighByte and **Element Unify** are the first companies to have SaaS offerings available that are based on the new **AWS** Data Fabric.



HighByte showed how the company helps to transform raw data into contextualized data. (Source: IoT Analytics)

10. Wireless connectivity on the shopfloor is becoming a reality

Shopfloor control operations are traditionally performed using wired/tethered connectivity between sensors/actuators, IO devices, controllers, and other compute platforms. However, HMI 2023 revealed that wireless may be becoming a viable alternative in some cases.

- On the field device level, **Kunbus**, **Hilscher**, and **CoreTigo** showed how IO-Link wireless (based on IEC 61131-9) allows for stable cableless data flows between sensors/actuators and IO-Link master devices, even for time-critical applications.
- **WIKA** and **Pepperl + Fuchs** showcased sensors and field instruments that come embedded with LPWAN connectivity (more specifically with LoRaWAN).

- A sizeable area of the fair was also dedicated to industrial private 5G, with vendors such as **Nokia** and **Ericsson** discussing how industrial deployments have moved beyond the pilot phase.

Nokia showcased its “One Platform”, an end-to-end private 5G solution (incl. device, network equipment, infrastructure, managed services, and cloud). (Source: IoT Analytics)

Putting the observations into perspective

The pace of innovation around industrial technology is high, and the fair highlighted that some exhibitors are faster to market and more strategic than others as they bring out new technologies. The role of IT players (small and large) has also increased in importance in the field.

Several of the trends highlighted in this conference summary are not new, but they are intensifying, and different nuances are emerging. We already highlighted the move toward software, cloud, AI, wireless, and a bigger solutions and IT technology focus in our 2022 conference wrap-up (see here). 2023 Hannover Messe confirmed these trends once again.

What stood out as new in 2023 that we did not observe in 2022?

- The industrial metaverse narrative
- Generative AI use cases
- DataOps tools becoming important
- Sustainability tools maturing
- Virtual PLC and private 5G technologies taken much more seriously

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