FACTORY-X

Factory-X

Demonstrator Booklet

PART OF MANUFACTURING-X

Funded by the European Union
NextGenerationEU

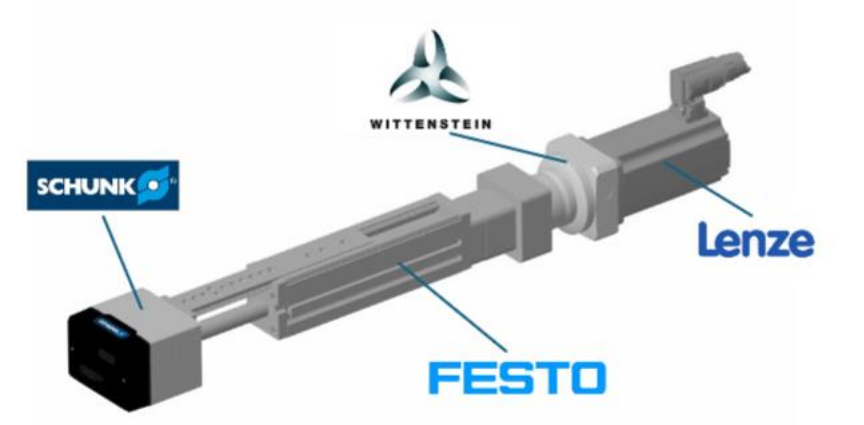
Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

Integrated Toolchains and Collaborative Engineering
Find the right solution with no effort

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Integrated Toolchains and Collaborative Engineering



Description

Automated solution finding for complex multi vendor systems with just a few clicks. This is the story about our demonstrator. It shows how - based on a few requirements (e.g. captured in requirements management tools or PLM systems) – an automated solution finding process is able to find cross-manufacturer solutions.

Challenges

The difficulty in designing manufacturer-heterogeneous systems lies in the differing product information and in inhomogeneous sizing tools offered by manufacturers. To enable a sequential cross-manufacturer tool chain, the submodel „Sizing of Power Drive Trains“ within the Asset Administration Shell is used, which standardizes the design of electric drive trains.

User Benefits

This approach enables significantly faster quotation preparation for machine builders. The resulting increase in speed does not come at the expense of quality, as the solution results are calculated by manufacturers themselves and are therefore reliable.

Contact

Johannes Hoos
johannes.hoos@festo.com
www.factory-x.org

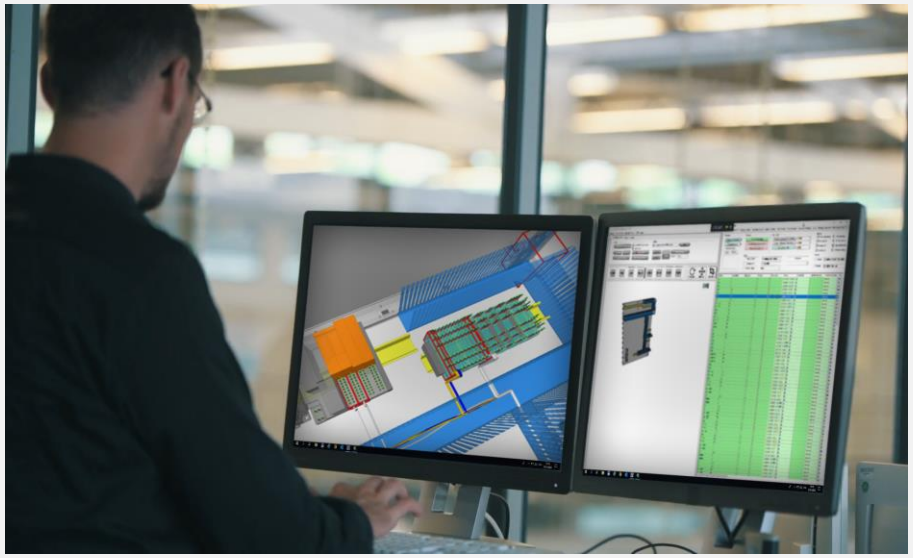
Festo SE & Co. KG
Esslingen am Neckar

Integrated Toolchains and Collaborative Engineering Productivity Raise by continuous Engineering data flows

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Integrated Toolchains and Collaborative Engineering



Contact

Mirko Löffler
mirko.Loeffler@siemens.com
www.factory-x.org

Siemens AG, location Chemnitz

cabinet systems solution

Description

Based on real world user stories in electrical engineering, as-is analysis are made and the necessary target-state is derived. Clear focus on productivity raise by data continuity.

Representing the user in an engineering toolchain along different companies and different (engineering) software tools given What is needed in the daily life of an electrical engineer and which comfort needs a new solution to be accepted from the market?

Challenges

- Time consuming processes
  - searching for component details, searching for 3D-macros
- Time consuming data transfer
  - transfer from electrical drawing to layout planning, transfer from drawings to configuration software of component suppliers
  - transfer from IT-systems to machines, transfer of data to blue collar workers

User Benefits

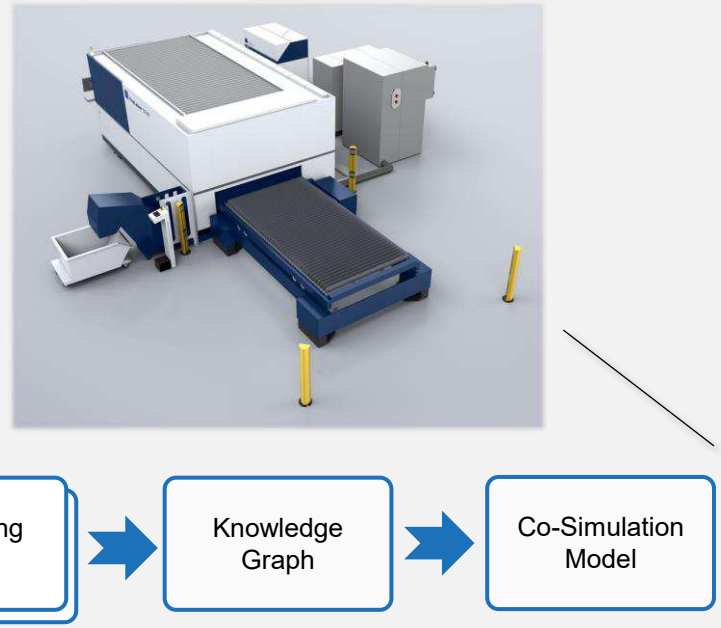
- Data runs seamlessly between systems in house and from suppliers, based on AAS and MX-Port technologies
- Easy to integrate configuration software based on AAS and MX-Port technologies
- Huge rise in productivity by eliminating wasted time for searching and transferring

Integrated Toolchains and Collaborative Engineering
Automatic generation of co-simulation models

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Integrated Toolchains and Collaborative Engineering



Description

The demonstrator presents an approach for the automatic generation of co-simulation models in the context of virtual commissioning (VC) of machine tools. A target picture for a seamless and integrated engineering toolchain is developed that is based on standards for data representation like the AAS, the FMI and SSP, or the STEP AP 242 format. Engineering data integration is realized through an RDF knowledge graph based on a domain ontology for VC. The concept is applied and verified using engineering data of a machine tool for sheet-metal processing and its supplier components. We demonstrate that with our approach most of the manual effort for simulation model creation can be avoided.

Challenges

For VC, previously created engineering data of all involved domains need to be integrated to build a holistic virtual prototype of the machine tool. Heterogeneous data sources and the lack of data interoperability between engineering tools hinder the simulation model creation process. In modeling praxis, information is still often exchanged in the form of texts or figures using documents like PDFs or through proprietary data formats. This leads to a significant manual effort to re-model the machine tool for VC. Thereby, the potential of VC is limited due to the lack of interoperability in the engineering toolchain.

User Benefits

- Efficient acquisition of engineering data from different sources via MX-Port combining AAS with established engineering data formats
- Data integration and semantic enrichment to enable efficient access via queries
- Simulation model generation in standard formats (SSP, FMI, STEP AP 242)

✓ generation of co-simulation models for virtual commissioning without manual modeling steps allowing efficient testing and qualification of machine tool control software

Contact

Kevin Diebels
Kevin.diebels@trumpf.com
www.factory-x.org

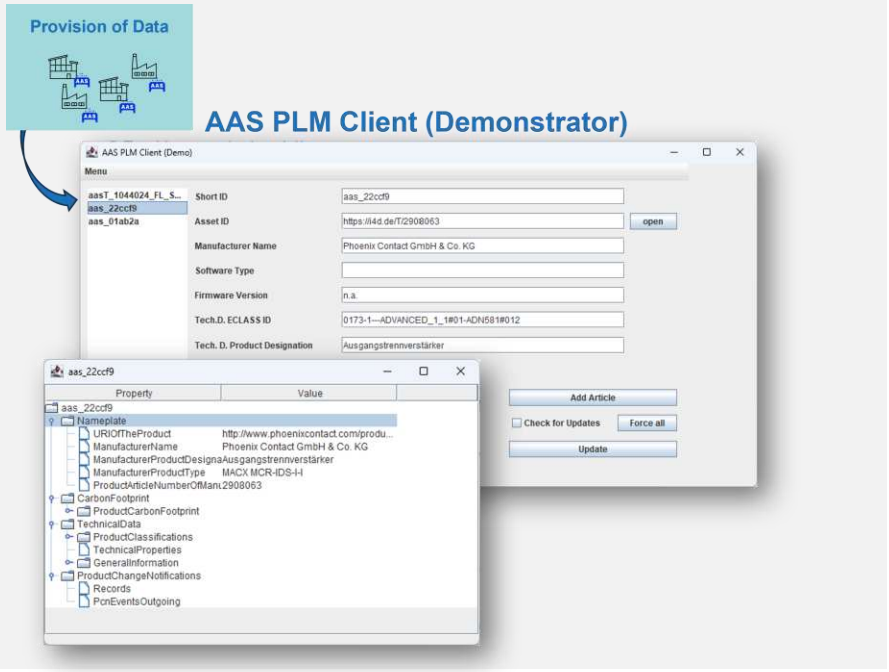
TRUMPF Werkzeugmaschinen SE + Co. KG
Location Ditzingen

Information Update and Change Service
AAS PLM Client

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Information Update and Change Service (Horizontal)



Contact

Olaf Graeser
ograeser@phoenixcontact.com
www.factory-x.org

Description

The PLM system manages, among other things, purchased parts, as well as bills of materials, documentation, software and firmware versions.
This demonstrator represents a Product Lifecycle Management (PLM) system which can import product information based on Asset Administration Shells (AAS).

Challenges

Keeping data on purchased parts up-to-date in the PLM system is a manual, time-consuming, and, above all, expensive process. Furthermore, product change information is often sent by the manufacturer's sales department to the customer's purchasing department via email. Therefore, it can happen that the information never even makes its way into the PLM system.

User Benefits

By connecting the customer's system (here, PLM) directly to the manufacturer's repositories, automatic import of product information into a target system can be implemented. Additionally, information regarding product changes is sent directly to the customer's system, ensuring that the right person receives the right information at the right time to decide how the customer should handle the product changes.

Information Update and Change Service
Common Device Management

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Information Update and Change Service (Vertical)

Description

A common device management (CDM) is a vendor agnostic software suite to discover, identify and manage devices and assets in the individual factory shopfloors. It plays a central role in connecting the local, factory specific installation to the Factory-X data space in order to complete the discovered information with vendor provided (new) information. One of such information are product change notifications (PCN) to inform about outstanding (security) updates.

Challenges

Creating a vendor agnostic representation of assets and devices and enabling discovery and update of these devices across heterogeneous communication physics and protocols. Allowing secure updates without interrupting production or endangering shopfloor personal was the key design driver.

User Benefits

By automatically creating an inventory of the installed base, factories can automatically be informed about changes (e.g. updates) via the MX-Port from the vendor specific Asset Administration Shells. Thus, keeping installations up to date and secure. The CDM allows to identify, plan and if wanted also to execute updates of single assets or fleet of assets.

Contact

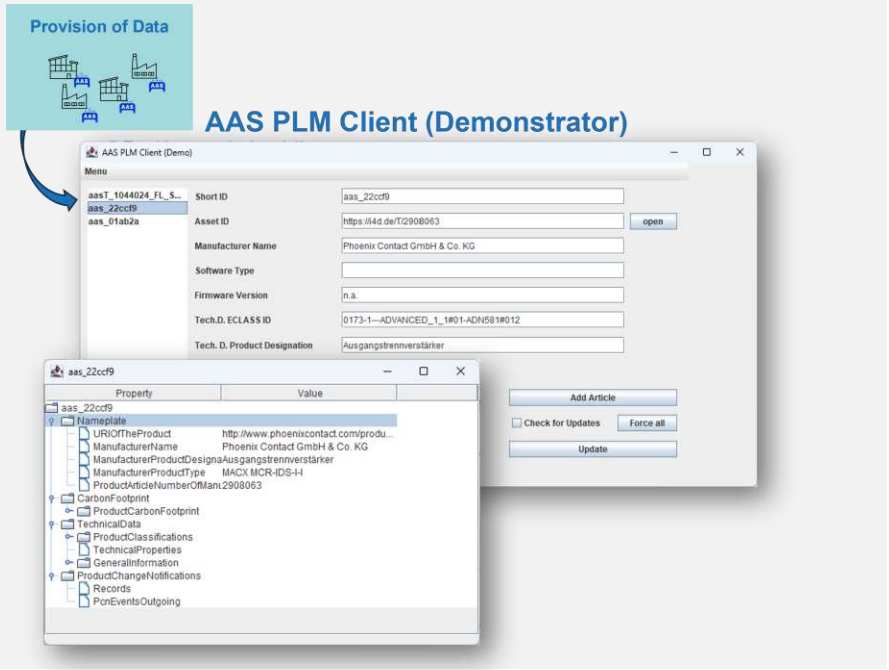
Dominik Tacke
dominik.tacke@siemens.com
www.factory-x.org

Information Update and Change Service
AAS PLM Client

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Information Update and Change Service (Horizontal)



Contact

Olaf Graeser
ograeser@phoenixcontact.com
www.factory-x.org

Description

The PLM system manages, among other things, purchased parts, as well as bills of materials, documentation, software and firmware versions.
This demonstrator represents a Product Lifecycle Management (PLM) system which can import product information based on Asset Administration Shells (AAS).

Challenges

Keeping data on purchased parts up-to-date in the PLM system is a manual, time-consuming, and, above all, expensive process. Furthermore, product change information is often sent by the manufacturer's sales department to the customer's purchasing department via email. Therefore, it can happen that the information never even makes its way into the PLM system.

User Benefits

By connecting the customer's system (here, PLM) directly to the manufacturer's repositories, automatic import of product information into a target system can be implemented. Additionally, information regarding product changes is sent directly to the customer's system, ensuring that the right person receives the right information at the right time to decide how the customer should handle the product changes.

Information Update and Change Service
Common Device Management

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Information Update and Change Service (Vertical)

Description

A common device management (CDM) is a vendor agnostic software suite to discover, identify and manage devices and assets in the individual factory shopfloors. It plays a central role in connecting the local, factory specific installation to the Factory-X data space in order to complete the discovered information with vendor provided (new) information. One of such information are product change notifications (PCN) to inform about outstanding (security) updates.

Challenges

Creating a vendor agnostic representation of assets and devices and enabling discovery and update of these devices across heterogeneous communication physics and protocols. Allowing secure updates without interrupting production or endangering shopfloor personal was the key design driver.

User Benefits

By automatically creating an inventory of the installed base, factories can automatically be informed about changes (e.g. updates) via the MX-Port from the vendor specific Asset Administration Shells. Thus, keeping installations up to date and secure. The CDM allows to identify, plan and if wanted also to execute updates of single assets or fleet of assets.

Contact

Dominik Tacke
dominik.tacke@siemens.com
www.factory-x.org

“PacXplorer” (Uhlmann Demonstrator) – Systematic data provisioning of machine information

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Collaborative Information Logistics

PacXplorer
Smart Lifecycle Solution Demonstrator

Uhlmann UHLMANN GROUP · SAP · BAYER · TÜV SÜD · codewerk

Description

The PacXplorer demonstrator shows the systematic provisioning of machine information for the Uhlmann C 2155 based on a standardized Asset Administration Shell (AAS). The asset information is accessible via an ID-Link, providing a single source of truth for all partners involved. Using SAP Business Network Asset Collaboration (BNAC) or Codewerk Platform, released asset data can be shared and collaboratively used across organizations. This enables partners to work on the same information basis and directly initiate follow-up processes such as inspection or maintenance orders. This is demonstrated by the handover of a Uhlmann machine to Bayer (the customer), including an inspection performed by TÜV Süd.

Challenges

Distributed asset information across heterogeneous systems: Asset information is distributed across multiple systems, making consistent access and usage difficult. In addition, missing standards complicates data interpretation, exchange, and reuse across partners and systems and hinders interoperability.

High manual coordination effort: Searching, explaining, sharing, and aligning information requires extensive manual communication, e.g. via email and phone, causing media breaks.

Error-prone information handling: Manual data transfer and multiple data copies increase the risk of inconsistencies and incorrect decisions.

User Benefits

Single source of truth for asset information: Users gain access to a complete, consistent, and up-to-date view of machine and asset data, independent of where the data was originally created or stored. This reduces searching, manual consolidation, and reliance on undocumented knowledge. This information can be accessed, e.g., via the ID-Link. Scan the QR code to retrieve detailed asset information from the C 2155.
Reduced integration and engineering effort: By harmonizing data structures and semantics, users can significantly reduce manual data mapping, custom interfaces, and one-off integrations, lowering engineering costs and shortening project timelines.

Contact

Dr. Patrick Sapel
sapel.p@uhlmann-group.com
www.factory-x.org

Further information

Paperless handover documentation – using MX-Port Leo for automated transfer of asset information

Demonstrator Type
- [X] physically
- [X] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Collaborative Information Logistics

Description

The factory operator is ordering an automation system at a machine builder. After manufacturing he automatically receives a simple interoperable digital twin. The digital twin can be used in asset management processes.
The transfer happens by using the data model and interfaces of the asset administration shell specification. The MX-Port Leo and shared services are defining how companies and applications can find each other and setup a secure connection. With this approach the information transfer is fully automated.

Challenges

When assets are ordered by a factory operator from a machine builder or component manufacturer, there is always technical information required to come with the asset to the factory operator.
This information about assets is exchanged between business partners, and there are high efforts required to add the information to applications and make them available to end users.
Data model, interfaces and security must be aligned to start an automated information exchange between business partners and applications.

User Benefits

Simplicity, standardization and scalability is important.
- Automate the process of information handover for ordered assets.
- Reduced manual efforts.
- Reduced search times
- Better information quality

Contact

Dr. Carl-Philipp Ding
carl-philipp.ding@basf.com
www.factory-x.org

Scan the QR code and take on the role of the factory operator at the ZVEI demonstrator:

UhImann FX Demonstrator (Production Site Laupheim) – Production Data Sharing Based on Information Provisioning Service

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Collaborative Information Logistics

Description

This demonstrator showcases how production data from a DMG MORI machine can be systematically made available via an information provisioning service within the Factory-X ecosystem. The demonstrator implements a standardized IT/OT data flow, enabling the structured provision and controlled sharing of production-, condition-, energy-, and quality-related data across systems and organizational boundaries. The setup serves as a practical validation environment for interoperable data exchange concepts, demonstrating how machine data can be reused for multiple digital use cases with minimal vendor-specific point-to-point integrations.

Challenges

Distributed data sources: Production and condition data from the DMG MORI machine are generated at different technical layers (machine control, sensors, edge devices, IT systems), making consolidation and consistent access difficult.

Heterogeneous interfaces and protocols: Different communication mechanisms (e.g., MQTT, REST API, proprietary interfaces) require harmonization to enable reliable and scalable data provisioning.

Lack of standardized information provisioning: Without a common approach, data exchange between shopfloor systems and higher-level IT or external partners leads to high integration effort and limited reuse.

User Benefits

Standardized access to production data: Users benefit from a unified and structured access to DMG MORI machine data, independent of the underlying systems or data sources.
Reduced integration effort: The information provisioning service minimizes custom interfaces and point-to-point connections, lowering engineering effort and implementation costs.
Reuse of machine data across use cases: Once provisioned, production data can be reused for different applications such as condition monitoring, energy analysis, quality documentation, or sustainability reporting.

Contact

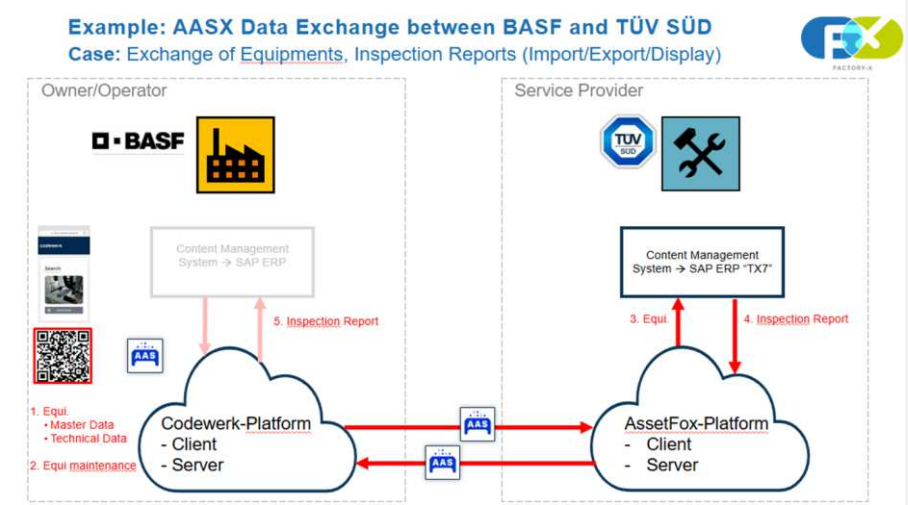
Dr. Anna Hörner and Dr. Patrick Sapel
hoerner.a@uhlmann-group.com; sapel.p@uhlmann-group.com
www.factory-x.org

AASX Data Exchange between BASF and TÜV SÜD of Equipments and Inspection Reports

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Collaborative Information Logistics



BASF codewerk SIEMENS TÜV SÜD

Contact

Dr. Peter Herrmann
peter.herrmann@tuvsud.com
www.factory-x.org

Description

Data of a technical object (equipment) used at BASF - including master data - is being transmitted via functionalities from the applications Codewerk to AssetFox and to the backend SAP system of TÜV SÜD. Based on given data, TÜV SÜD documents an inspection. The inspection results are then transmitted back via the aforementioned applications.

Challenges

Companies continuously strive to increase the transparency of their data and - where appropriate - to make it available to all partners as well. A particular challenge is to exchange data adjustments among multiple cross-company partners in a timely manner, thereby ensuring that the information remains up to date.

User Benefits

The automated and timely transfer of object information to the service provider, such as TÜV SÜD, as well as the transmission of additional data (inspection results), increase data timeliness and quality. The discoverability of information is improved and made available to all parties. In the final stage of development, multiple partners can also collaborate in an interoperable manner. The underlying Asset Administration Shell enables a structured language for the data exchange.

Condition Monitoring Led Services Demonstrator Ditzingen

Demonstrator Type

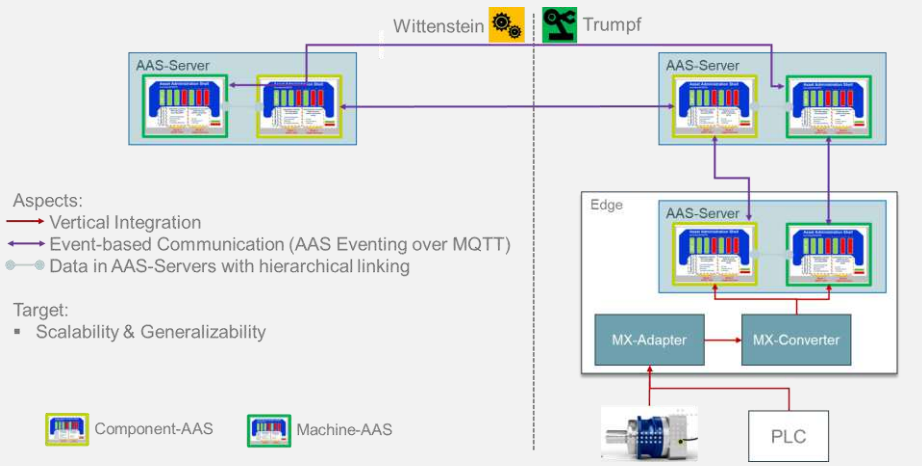
- [X] physically
- [ ] virtual

MX-Port

- [X] Hercules
- [ ] Leo
- [ ] Orion

Use Case

Condition Monitoring Led Services



Contact

Tobias Ziermann
tobias.ziermann@wittenstein.de
www.factory-x.org

Description

This demonstrator evaluates key AAS submodels (Digital Nameplate, Contact Info, BOM, Time Series) and cloud-to-cloud communication between component manufacturers and machine builders via the MX-Port. It also tests asynchronous data exchange using MQTT and validates the setup with TP4's Hercules artifacts.

Challenges

Companies struggle to scale secure and interoperable data sharing due to fragmented systems, inconsistent data models, and the need to maintain full data sovereignty across organizational boundaries. At the same time, transforming isolated digitalization pilots into scalable, cross-sector ecosystems requires standardized communication frameworks and validated use cases that work reliably.

User Benefits

The demonstrator shows how standardized AAS-based and asynchronous cloud communication enables seamless, interoperable data exchange. It reduces integration effort, improves cross-company collaboration, and supports scalable, data-driven services.

Condition Monitoring Led Services Demonstrator Bad Neustadt

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Condition Monitoring Led Services

1.Request from machine operator to process analysts

2.Acquisition of process image (Data Recorder)

3.Data transfer with MX Converter

4.Data monitoring and review

5.Download configuration with MX Converter

6.Execute process monitoring and generation of report

Contact

Stephan Platen
stephan.platen@siemens.com
www.factory-x.org

Description

During the machining process, monitoring data is continuously acquired and evaluated in real time. This demonstrator evaluates the Asset Administration Shell as a central data hub for the factory operator, with a focus on monitoring and analyzing machining process data via an AAS server. It was developed together with TP-2.3 and validates the practical use of the MX-Port “Leo” for configuring process-monitoring apps and optimizing machining processes.

Challenges

Setting up new digital services and exchanging asset information remains a major challenge. Stakeholders face technical, economic, and organizational barriers that hinder seamless cross-stakeholder data sharing, while integrating asset information into end-user applications demands significant time and effort.

User Benefits

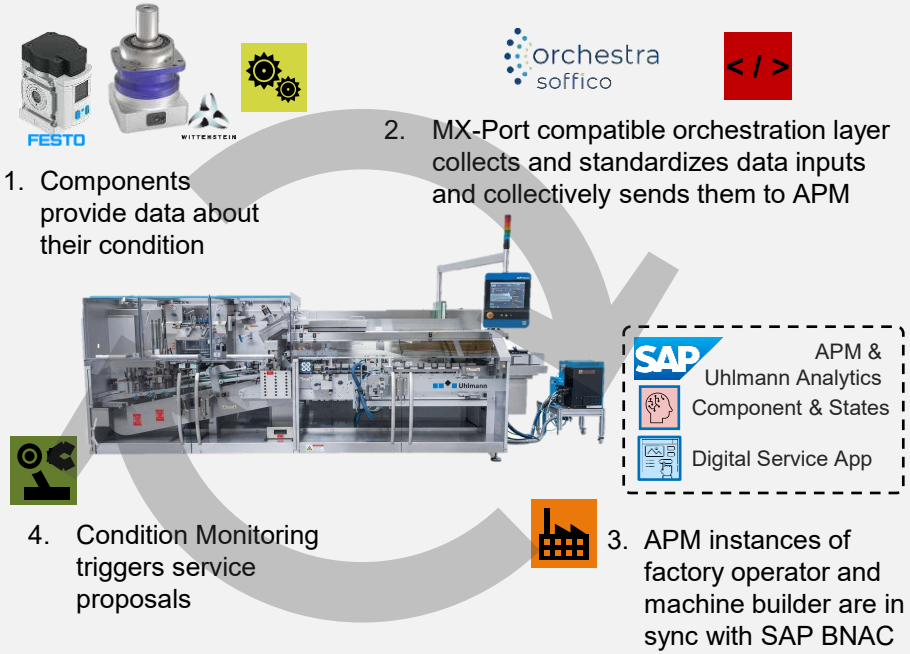
The setup demonstrates how AAS-based integration simplifies process-monitoring and enables seamless data exchange. It shows that the MX-Port “Leo” supports reliable and interoperable communication for improved diagnostics and faster system integration. A key benefit is the transparent and fully traceable data-exchange process.

Uhlmann Demonstrator “PacXplorer” – Smart services based on collaborative condition monitoring

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [X] Hercules
- [ ] Leo
- [X] Orion

Use Case
Condition Monitoring Led Services



Contact

Tanaro Schädler
schaedler.t@uhlmann-group.com
www.factory-x.org

Description

This demonstrator shows cross-company interoperability in a CMLS process. A machine is integrated via OPC UA to evaluate machine and component (gearbox, flow sensor) condition data. When limits are exceeded, an automated maintenance and service workflow is triggered and digitally documented. The demonstrator is a fully functional Uhlmann packaging machine (C 2155 Cartoner) integrated with hardware & software solutions of further project partners.

Uhlmann UHLMANN GROUP

PacXplorer
Smart Lifecycle Solution Demonstrator

Challenges

Interoperability: Aligning Wittenstein gearbox + Festo flow signals (limits, counters, states) into one condition model required significant standardization

Connectivity: Stabilizing edge/PLC-to-cloud data flow (performance, latency, sync) for condition monitoring and dashboards was challenging.

SAP APM/FSM/BNAC: Asset & condition data onboarding (replication, format mapping) and clear cross-company ownership needed extra integration effort

User Benefits

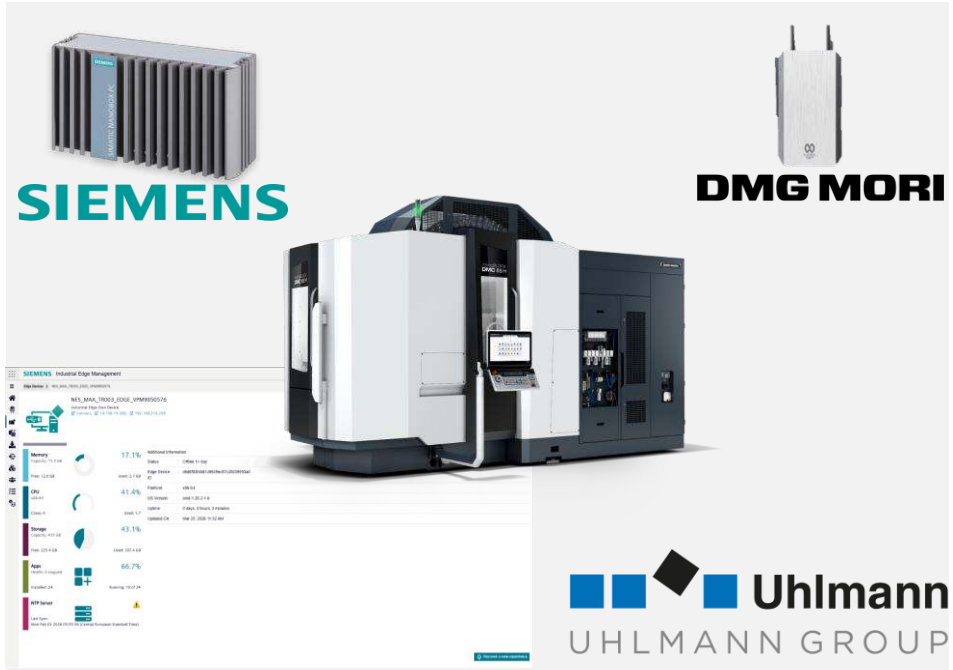
The demonstrator proves seamless cross-company workflows: automated fault detection, automatic technician dispatching, and fully digital maintenance documentation. It highlights how Factory-X enables efficient, end-to-end service processes across all stakeholders.

Uhlmann FX Demonstrator (Production Site Laupheim) – Monitoring of Machine Performance and Condition

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Condition Monitoring Led Services



Contact

Tanaro Schädler
schaedler.t@uhlmann-group.com
www.factory-x.org

Description

This demonstrator showcases collaborative condition monitoring on a DMG MORI milling machine in Uhlmann's production environment. Siemens Industrial Edge integrates machine, process and sensor data from available interfaces, with the DMG MORI Condition Analyzer Box considered as part of the overall data access architecture for additional machine insights. The setup is intended to analyze spindle and axis condition, tool wear indicators and process stability deviations, and to serve as a basis for cross-company condition monitoring services based on standardized data exchange.

Challenges

Interoperability: CNC, PLC and sensor data must be harmonized across heterogeneous machine interfaces and data semantics.

Connectivity and data context: High frequency condition data, process context and part or tool references must be captured, buffered and transferred reliably for meaningful analysis.

Ecosystem integration: The demonstrator depends on coordinated integration of Siemens Edge, Sinumerik access, the Condition Analyzer Box and partner applications.

User Benefits

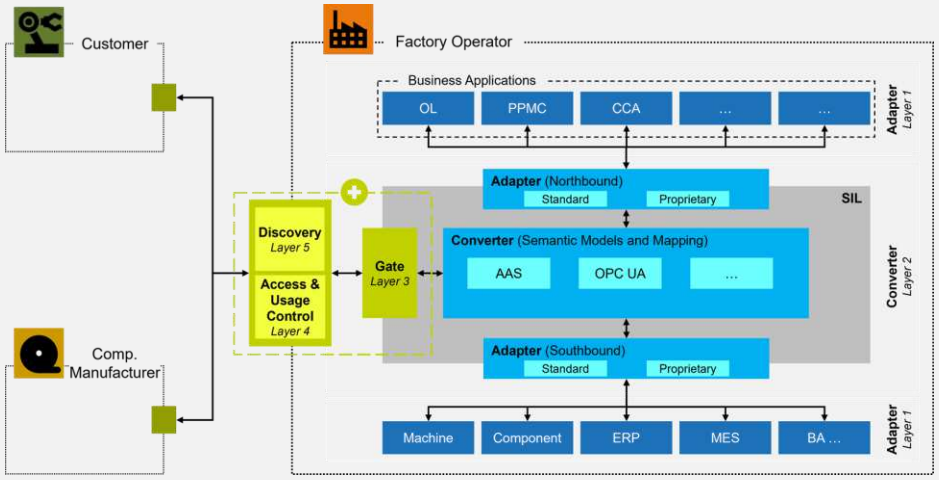
Earlier detection of spindle, axis and wear related anomalies. Reduced unplanned downtime and better maintenance planning. Basis for new data driven services between factory operator, machine builder and technology partners.

Modular Production – Execute Changeover

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☐ Leo
- ☐ Orion

Use Case
Modular Production



Uhlmann UHLMANN GROUP · soffico · Fraunhofer IWU · SIEMENS · DMG MORI

Contact

Markus Benndorff
markus.benndorff@soffico.de
www.factory-x.org

Description

In make-to-order or small-batch manufacturing, frequent changeovers reduce productivity. It is shown how Factory-X enables modular production by connecting machines, cells, and business applications through interoperable data spaces. Assets are described with standardized digital twins (Asset Administration Shell / OPC UA models) and exchanged. A shopfloor integration layer provides uniform access to static and dynamic asset data so planning, configuration, and changeover steps can be orchestrated and executed faster across heterogeneous equipment.

Challenges

Key challenges include the high manual effort to capture, maintain, and share master data, reliance on non-formalized shopfloor know-how, and costly integration of new machines due to many proprietary interfaces and missing standards. Modular production adds complexity because process steps, capabilities, and configurations have many dependencies. In addition, cross-company data sharing requires secure access and usage control, trusted identification/discovery of assets, and semantic interoperability (mapping between different information models such as AAS and OPC UA).

User Benefits

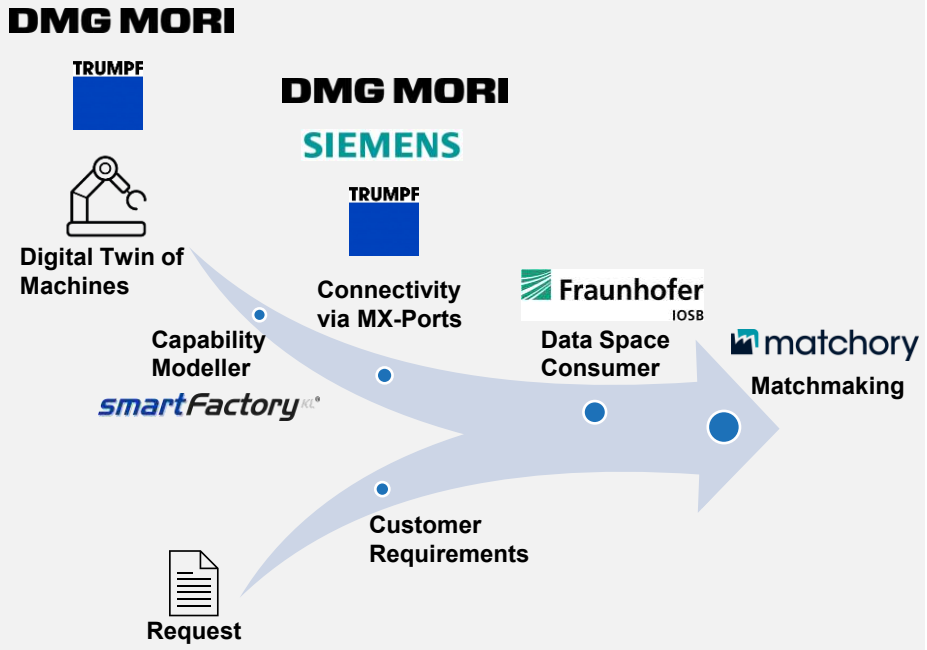
Users benefit from faster and more reliable changeovers, reducing non-value-adding setup time and improving economic performance in heterogenous environments. Standardized asset descriptions and interoperable data access lower integration effort, enabling plug-and-play onboarding of machines, cells, and software modules. Planners gain better scheduling inputs (e.g., setup matrices and times), operators receive guided step-by-step changeover instructions, and factory owners can scale modular solutions across sites and partners while keeping control over data access and usage in the data space.

Manufacturing as a Service - Supplier Capability Notification

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☒ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Manufacturing as a Service (MaaS)



Description

The demonstrator showcases the seamless integration of manufacturing resources into digital platforms via standardized MX-Ports. By utilizing the Asset Administration Shell (AAS) submodel "Capability Description“, a supplier's machines and resources are semantically structured and shared. This allows manufacturing marketplaces to automatically onboard suppliers, visualize their expertise, and utilize high-precision matchmaking to connect data consumers with the right manufacturing capabilities.

Challenges

To enable a seamless transition to digital manufacturing marketplaces, manual data provision processes must be automated. The biggest challenge lies in capturing manufacturer-specific machine capabilities and resources in a structured, semantic format. Through our standardized information structure and seamless connectivity via MX ports, it is possible to ensure that suppliers become visible on various platforms with minimal effort, thereby enabling efficient matching.

User Benefits

Digital transformation and automated processes make it much easier to enter manufacturing marketplaces. Manufacturers only need to enter their production capacities in a structured format once to be visible across multiple platforms simultaneously. The use of standardized interfaces and semantic data models enables seamless integration and efficient matchmaking between supply and demand. This drastically reduces the manual effort involved in data provisioning and increases suppliers’ market reach through a consistent, scalable, cross-platform presence.

Contact

Felix Schöppenthau
felix.schoeppenthau@iosb.fraunhofer.de
www.factory-x.org

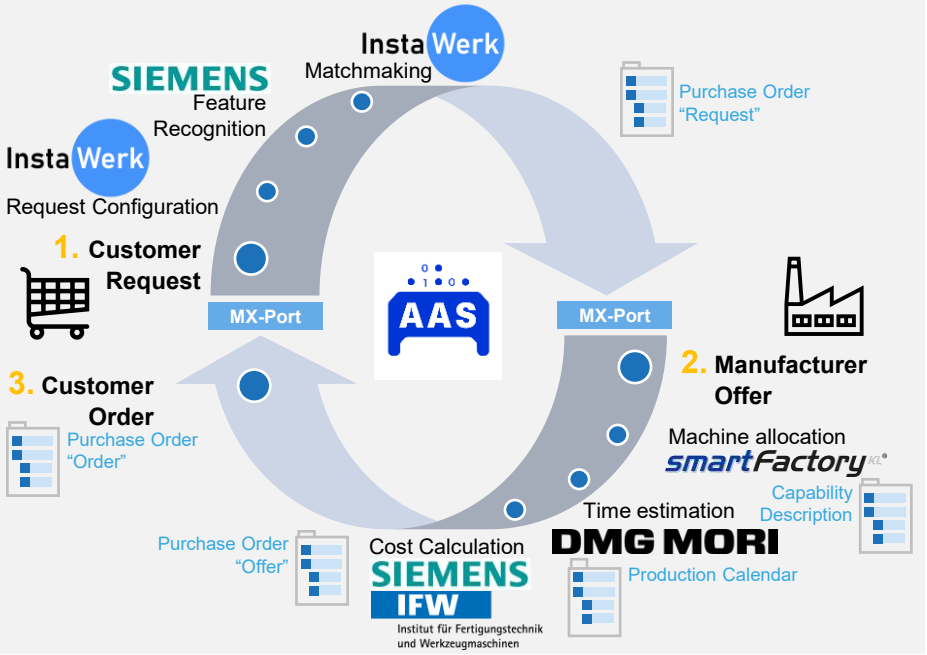
Further information

Manufacturing as a Service – Request-Offer-Order

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☒ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Manufacturing as a Service (MaaS)



Description

The demonstrator showcases the automated bidding process for manufacturers, who get their orders via digital on-demand-manufacturing platforms. By utilizing the Asset Administration Shell (AAS) submodel "Purchase Order", the customer's request as well as the supplier's offer are well defined, semantically structured and filled with all information that is necessary for further treatment and decision making, like machining feature recognition, capability matchmaking, processing time estimation, and cost calculation.

Challenges

The biggest challenge for manufacturers lies in fast offering, while dealing with high uncertainties in producing parts the supplier never produced before. The success rate for getting an order from on-demand-manufacturing platforms is very low. For being competitive, the cost calculation and production planning needs to be as precise as possible but with lowest effort.

User Benefits

Automated processes in bidding and planning are the key enabler for managing fast quotation. Through our standardized information structure and seamless connectivity via MX-Port, it is possible to ensure semantically correct data use and automated analysis. AI driven features support in handling uncertainties and decision making for small and medium enterprises being competitive on digital manufacturing marketplaces.

Contact

Birgit Obst
birgit.obst@siemens.com
www.factory-x.org

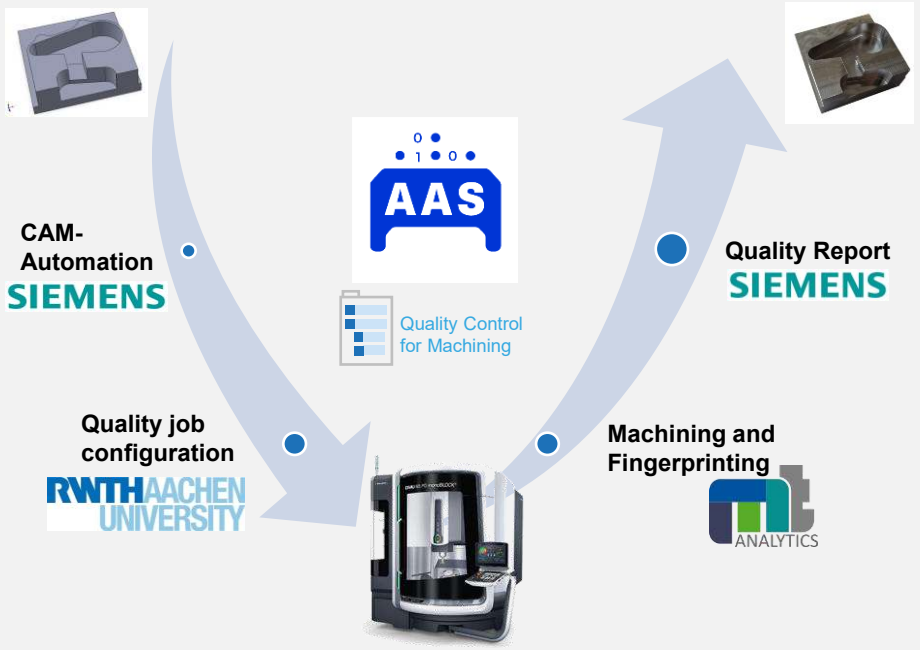
Further information

Manufacturing as a Service – Quality Control

Demonstrator Type
- [X] physically
- [X] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Manufacturing as a Service (MaaS)



Description

The demonstrator showcases the automated quality analysis for manufacturers, who get their orders via digital on-demand-manufacturing platforms. The Asset Administration Shell (AAS) submodel “Quality Control for Machining” accompanies the part machining process from operation planning, over quality requirement identification from PMI (product manufacturing information) to machining execution and automated monitoring for quality assurance and reporting to customer at delivery.

Challenges

Especially in low lot size production, which is typical for on-demand-manufacturing, the marge for quality assurance is very thin. Trial and error is not an option. Manufacturers need support in quality requirement identification, quality assurance during the machining process, and in prove of quality achievement to reduce effort in time and cost.

User Benefits

Standardized information structures allow processes to be automated. This enables seamless data transition from IT management down to OT and back and reduces efforts in quality assurance for small and medium enterprises being competitive on digital manufacturing marketplaces.

Contact

Catharina Czech
catharina.czech@siemens.com
www.factory-x.org

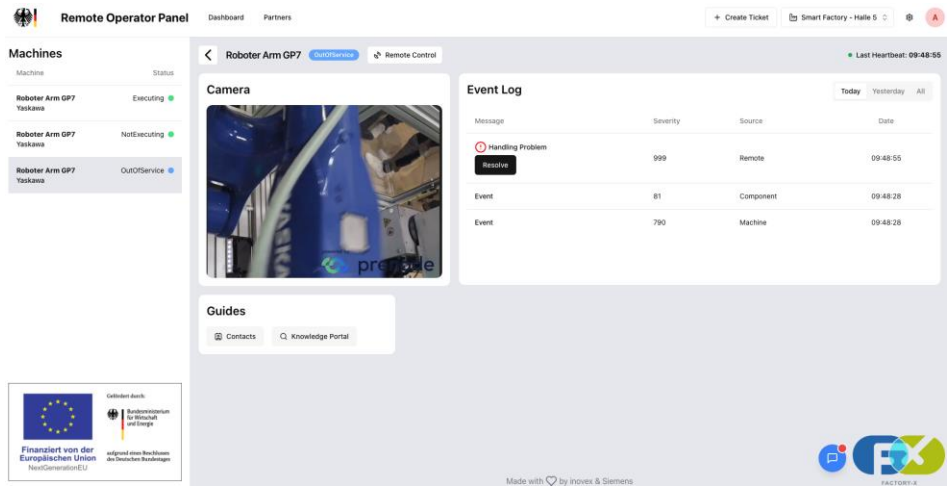
Further information

AOaaS - Remote Operator Panel

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☒ Hercules
- ☐ Leo
- ☒ Orion

Use Case
Autonomous Operation as a Service



Description

The Remote Operator Panel is a frontend designed to demonstrate the AOaaS use case. Machines can be integrated for remote monitoring. If a fault occurs, the panel helps analyze the error, access historical knowledge, and utilize many other troubleshooting services (e.g., live camera stream). Services can be offered and used via the dataspace. Information is exchanged in a standardized manner via the MX port.

Challenges

To enable autonomous operation by a remote operator, it is important that all key information is modeled and exchanged in a standardized manner and that the flow of information through the MX port is consistently regulated. This allows services to be profitably integrated via the dataspace.

User Benefits

Once a machine has been integrated into the Remote Operator Panel for monitoring, all relevant information can be viewed in one application. In the event of a fault, contextual information can be viewed directly, and various services can be utilized. Users can access the machine control system or peripheral services such as live streaming, knowledge management, or ERP data. The application is complemented by a chatbot. This allows a qualified remote operator to monitor many machines.

Contact

Pascal Rübel
pascal.ruebel@smartfactory.de
www.factory-x.org

Further information

SmartFactory-KL Fault Correction Demonstrator

Demonstrator Type
- [X] physically
- [X] virtual

MX-Port
- [X] Hercules
- [ ] Leo
- [ ] Orion

Use Case
Autonomous Operation as a Service

Description

The Fault Correction Demonstrator is based on the SmartFactory-KL model factory ecosystem, which builds custom sample products on industry-standard hardware. All production steps are described in the digital twin and are executed by cyber-physical production modules. Thanks to the interoperable description of all machine and product data in the Asset Administration Shell, fault events can be classified and, depending on their complexity, analyzed and resolved autonomously or by a remote operator. The demonstrator adapts the Autonomous Operation as a Service use case and demonstrates a real-world implementation using the MX-Port Hercules. For fault correction, various services can be requested via the dataspace, such as knowledge databases or live camera streams.

Challenges

Describing (new) failure scenarios and modeling them in the AAS can become quite complex when attempting to use autonomous troubleshooting strategies. Human intervention is often unavoidable. However, standardized data models and semantics can provide contextual information much more efficiently and enable the use of services to resolve a failure.

User Benefits

Users of this system benefit from being able to describe fault scenarios more effectively, enabling support services to propose a direct solution strategy. A remote operator can understand the context of the fault and take appropriate action without being physically present at the machine. This allows the availability of many machines to be increased simultaneously. Faults can be resolved in a staggered manner - autonomously, remotely, or, in safety-critical scenarios, on-site using conventional methods. A Remote Operator Panel enables a comprehensive overview of the machine and faults that occur.

Contact

Pascal Rübel
pascal.ruebel@smartfactory.de
www.factory-x.org

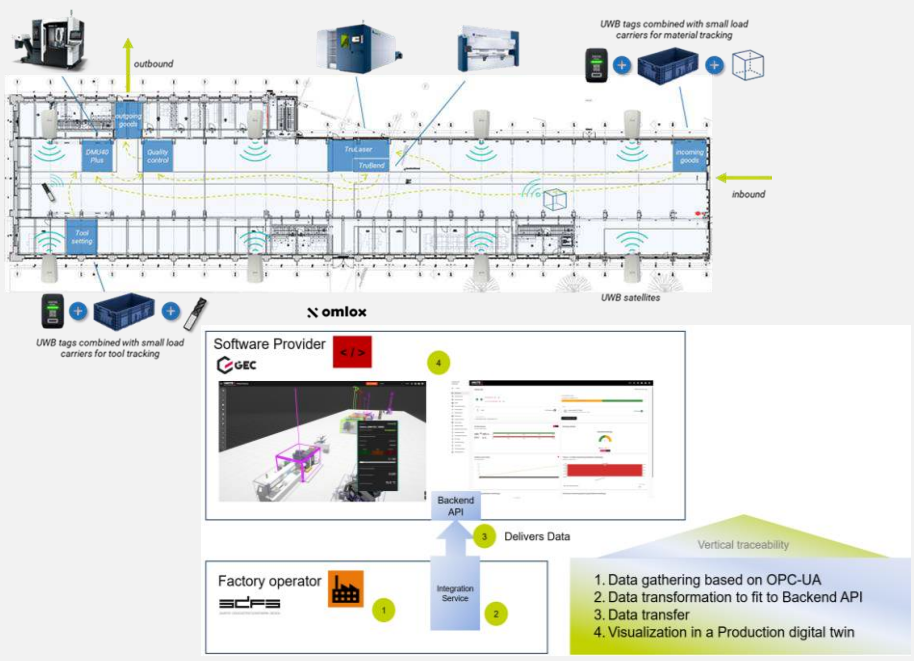
Further information

Shopfloor Data Transparency and Traceability

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☐ Leo
- ☐ Orion

Use Case
Traceability



Description

The S**hopfloor Data Transparency and Traceability demonstrator** focuses on the first step of the traceability journey.

Before quality notifications and other traceability-relevant data can be exchanged across partners, **core asset, quality, process, and position data** must first be prepared for exchange — provisioned, structured, and semantically harmonized.

In this demonstrator, data is collected at the factory operator level using OPC UA, then transformed, transferred, and visualized in a **Digital Twin of the production environment (Virtual Factory)**.

Challenges

A high variance of machines and data formats, missing unified semantic models, and limited resources are key challenges — especially for **SMEs**, which often lack the time, knowledge, and capacity required to implement data collection, transformation, and integration at scale.

User Benefits

Vertical data transparency and traceability form the foundation for **horizontal traceability** (data exchange across partners) by enabling consistent data collection and transformation at shopfloor level.

At the same time, factories benefit immediately from improved visibility into the current state of production. Visualizing shopfloor data makes inefficiencies visible and actionable. Factory operators gain **end-to-end transparency**, enable **process optimization**, support **internal quality investigations**, perform **vertical order tracking**, and can unlock the use of **AI-based analytics** through connected and structured production data.

Contact

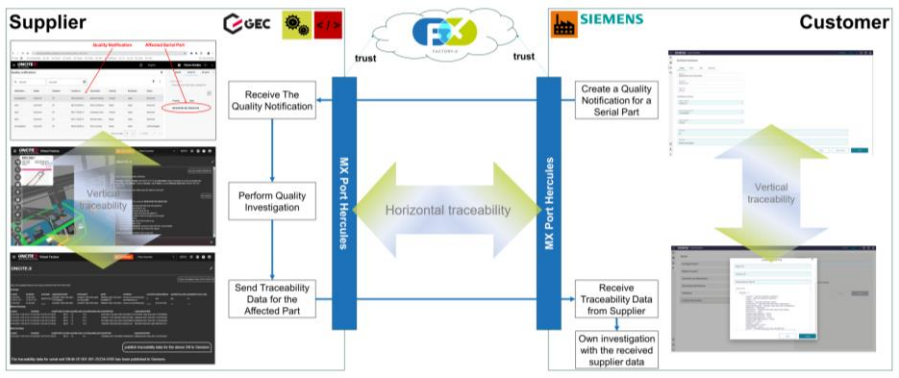
Lilija Kucinskaja
lilija.kucinskaja@gec.io
www.factory-x.org

Quality Investigation and Data Exchange across the Supply Chain using MX-Port Hercules

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☒ Hercules
- ☐ Leo
- ☐ Orion

Use Case
Traceability



Contact

Lilija Kucinskaja
lilija.kucinskaja@gec.io
www.factory-x.org

Description

The **Quality Investigation** and **Data Exchange** demonstrator shows how quality data exchange and quality investigation can be realized across the supply chain using MX-Port Hercules. It demonstrates standardized communication between supply-chain partners for exchanging quality notifications and traceability-relevant data based on Catena-X standards.

In the shown scenario, the factory operator detects a quality issue for a specific part and creates a quality investigation notification. This notification is exchanged with the supplier via MX-Port Hercules. The supplier analyzes the issue, provides traceability and quality data for the affected component, and sends the response back to the factory operator. The exchanged data supports investigation and decision-making on both sides and enables **horizontal traceability across organizational boundaries,** which is backboned/enabled by vertical traceability within the Customer.

Challenges

Cross-company quality investigations are hindered by heterogeneous systems, missing standards, manual communication, and limited trust between partners, making traceability slow and inefficient.

User Benefits

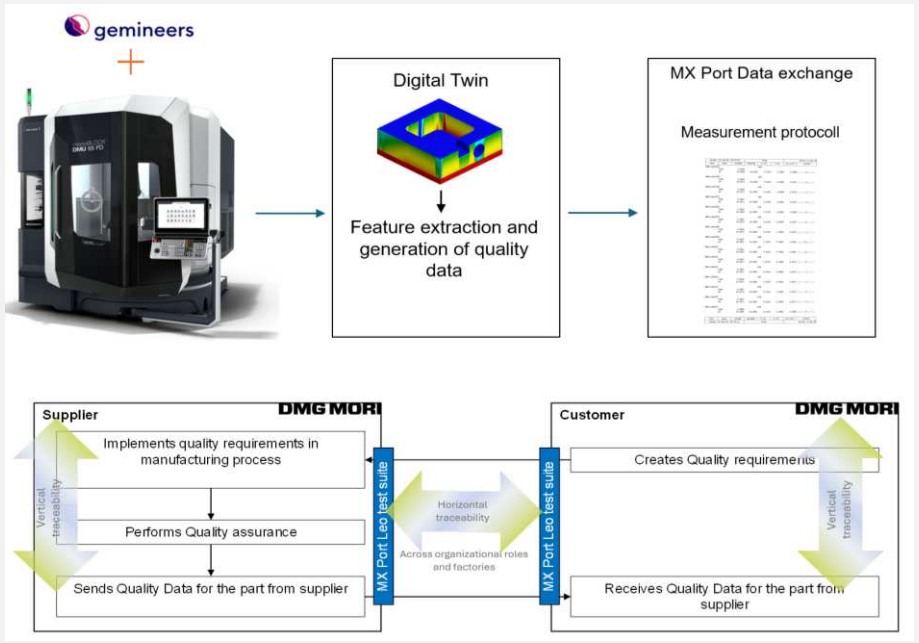
The demonstrator highlights how standardized data exchange with **MX-Port Hercules** transforms quality investigations into an efficient, cross-company process. By enabling secure and structured sharing of quality notifications and traceability data, partners can identify issues faster, collaborate more effectively, and reduce the time and effort required for root-cause analysis. While vertical traceability enables standardized gathering of relevant data, horizontal traceability provides clear visibility of affected parts across organizational boundaries, helping both factory operators and suppliers make confident, data-driven decisions. At the same time, the demonstrator validates Catena-X–based data exchange in a real investigation scenario, proving the feasibility of trusted, scalable quality collaboration across the supply chain.

From Machine Data to Cross-Factory Quality Exchange with MX Port Leo

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Traceability



Contact

Thomas Pipke
thomas.pipke@dmgmori.com
www.factory-x.org

Description

This demonstrator showcases how **vertically generated process and quality data** enables **standardized horizontal exchange** across enterprise entities. In this scenario, **DMG MORI manufactures an analogue part while process data is continuously recorded and quality data is generated during production** using the **gemineers Digital Twin App directly at the machine**. The resulting quality data, such as inspection and measurement protocols, is exchanged between DMG MORI sites acting as separate legal entities via **MX Port Leo**, demonstrating standardized and sovereign data exchange.

On the consumer side, the data is received via the **MX Port Leo Test Suite** and stored in a DMG MORI application, leveraging the **Handover Documentation Submodel** for structured and interoperable quality data exchange. For this PoC, DMG MORI assumes both supplier and customer roles.

Challenges

Heterogeneous machines and data formats, missing semantic standards, organizational boundaries, and limited resources make the provisioning, harmonization, and scalable exchange of quality-relevant shopfloor data complex.

User Benefits

This demonstrator shows how vertical traceability and data harmonization reduce quality-assurance effort by automating the **collection**, **structuring**, and **exchange of process and quality data**. Quality and inspection data is directly linked to the manufactured part and exchanged in a standardized and sovereign way between factories, validating the data-exchange platform. Manufacturing sites benefit immediately from improved transparency and **faster quality validation**, while establishing a scalable foundation for horizontal traceability, cross-company collaboration, and reuse of quality data for analytics, compliance, and future digital services.

Traceability XR Demonstrator von LNI 4.0

Demonstrator Type
- [X] physically
- [X] virtual

MX-Port
- [ ] Hercules
- [ ] Leo
- [ ] Orion

Use Case
Traceability

Description

The **Traceability XR Demonstrator by LNI 4.0** offers an **intuitive, haptic, and immersive XR experience** that makes traceability intuitive and tangible.

Through interactive visualization and gamification, users experience how product, process, and quality data are connected across the manufacturing lifecycle in an engaging and accessible way.

Challenges

Traceability is often abstract and complex, making it difficult to understand through traditional presentations. Limited human-centric interfaces result in low engagement, awareness, and acceptance - especially among non-technical users.

User Benefits

The demonstrator creates a **lasting learning experience** by combining **immersive XR technology** with **human-centered interaction and gamification**. Users gain an intuitive understanding of traceability concepts, improved engagement, and more effective knowledge transfer for training, communication, and awareness.

Contact

Dr. Hanna Theuer
hanna.theuer@lni40.de , info@lni40.de
www.factory-x.org

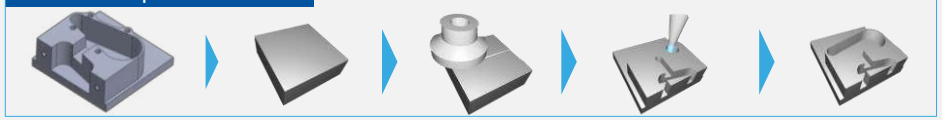
Energy Consumption

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [ ] Leo
- [ ] Orion

Use Case
Energy-Consumption and Load Management

Reference process



Demonstration vehicles

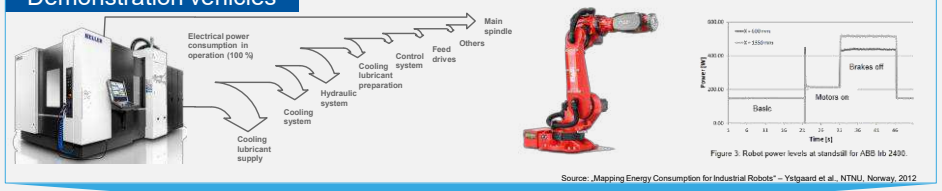
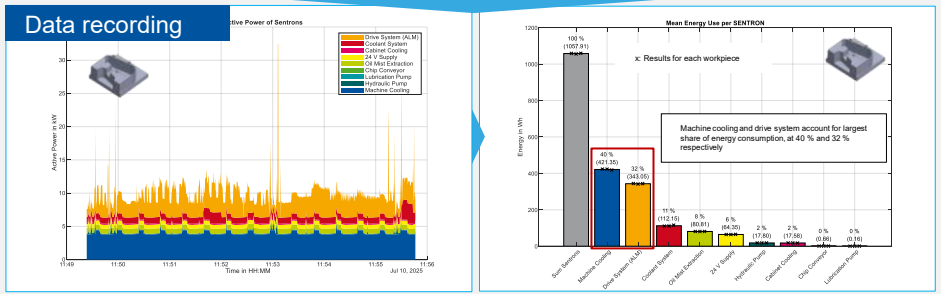


Figure 3: Robot power levels at standstill for ABB Irb 2400.

Source: „Mapping Energy Consumption for Industrial Robots" – Ystgaard et al., NTNU, Norway, 2012

Data recording



Contact

Dr. Stefan Denneler
stefan.denneler@siemens.com
www.factory-x.org

Description

Measurement and evaluation of the energy consumption of individual components of a milling machine based on a case study to derive energy-saving potentials. A total of 54 parts with a process time of approximately 5 minutes were manufactured under different conditions. For this purpose, 13 Sentron PAC energy meters were integrated into a Heller HF3500 and evaluated using high-resolution data acquisition. In addition a grinding robot was also equipped to assess saving potentials resulting from active or passive clamping, milling energy consumption, as well as cooling influences.

Challenges

During the processing of reference parts, the data were initially collected locally in the demonstrator and processed within a local network. Combining high frequency data from drive systems up to 100Hz with quasistatic operation data demand for job relevant data aggregation. The system is currently used to process energy data in order to calculate component-specific energy consumption and the CO_2 footprint, and to write the aggregated data into a submodel of an asset. The evaluations identify the main energy consumers and highlight potential energy-saving opportunities.

User Benefits

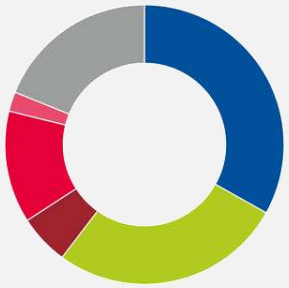
Creating transparency regarding the energy demand of individual consumers as a decision basis for identifying saving potentials and for developing control strategies leading to automated energy-saving functions. The provided data from energy consumption and machine operation details build the base layer for advanced PCF calculations. In addition this PoC is used for the developments of next generations Energy Control funtion Ctrl-E for Sinumerik with Energy Management PoC including MX-Port-Orion.

Provision of Energy Data via the Asset Administration Shell

Demonstrator Type
- [X] physically
- [X] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Energy-Consumption and Load Management



Description

The demonstrator shows how electrical energy demand in machining production can be captured on a workpiece-specific basis. It is based on a digital twin built on the Asset Administration Shell, into which communication-enabled sensor systems are integrated. The time-resolved power data of the components is acquired via various communication protocols and displayed in a monitoring system. In accordance with the established protocol, the calculation of the carbon footprint is conducted and meticulously stored in the Asset Administration Shell in a structured manner.

Challenges

Machine tools consume large amounts of energy, resulting in high operating costs and emissions. In practice, however, there is a lack of standardised, manufacturer-independent methods for measuring and analysing the energy consumption of individual machine components. Existing systems are often proprietary, which can make it more difficult to conduct a comprehensive analysis.

User Benefits

The electrical and pneumatic consumption of individual components can be measured precisely and visualised in real time through the manufacturer-independent integration of various sensors. This allows for the precise identification of energy losses and the subsequent derivation of specific energy-saving measures. The data can be exported with ease and incorporated into a digital twin, which serves as the basis for further optimisation.

Contact

Alexander Böttcher
boettcher@ifw.uni-hannover.de
www.factory-x.org

Further information

Energy monitoring & Energetic Digital Twin (eDT-X)

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Energy-Consumption and Load Management

Description

The demonstrator brings together business applications for energy monitoring and energy efficiency. In addition, it demonstrates how energy data can be exchanged across company boundaries via asset administration shells using eDT-X. For this purpose, the business applications are integrated into DMG MORI's existing CELOS-X factory, enabling application-oriented validation of the applications.

Challenges

By means of the data space and the provided applications, seamless documentation and transfer of data on the energy demand of machine tools is possible. Via the asset administration shell – which forms the technical basis of eDT-X – and the M-X-Port Leo, information on the energy demand of machine components can be shared with stakeholders in a targeted manner.

User Benefits

Through the manufacturer-independent integration of various sensors, the electrical and pneumatic consumption of individual components can be measured precisely and visualized live. This enables the targeted identification of energy losses and the derivation of concrete energy-saving measures. The data can be easily exported and fed into a digital twin, which serves as the basis for further optimizations.

Contact

Dr. Marcel Wichmann
marcel.wichmann@dmgmori.com
www.factory-x.org

Further information

https://media.dmgmori.com/de_DE/search?q=celos+x+factory&start=12

Uhlmann FX Demonstrator (Production Site Laupheim) - Energy Monitoring and Reduction in Real Production Environment

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Energy-Consumption and Load Management

Contact

Dr. Anna Hörner
hoerner.a@uhlmann-group.com
www.factory-x.org

Description

An energetic digital twin was established at our live production site on a DMG MORI milling machine to visualize energy data and identify energy reduction potentials through interoperable applications. For this purpose, the machine was equipped with current transformers, pressure gauges, Sentrons, a Siemens Edge device, and a DMG Condition Analyzer Box and integrated into our IoT system. The interoperable applications have been established within the use chase and enable energy monitoring of connection loads (pneumatic and electrical) as well as component wise energy consumption to establish energy efficiency and reduction potentials.

Challenges

The main consumers and their consumption behavior must be analyzed in order to determine whether conversion based on machine data can be used or whether additional sensors, such as Sentrons, need to be installed. These sensor data and machine data must then be synchronized in protocol and time and assigned to the corresponding machine processes.

User Benefits

Energy monitoring and reduction help to understand the energetic processes within a machine, to identify and implement energy-saving potentials. This leads energy reduction and, consequently, to cost savings and reduction of CO_2 emissions. The resulting interoperable data can be used to offer new services, for example, to share with (electricity) providers to achieve additional cost savings through contracting models, or to calculate the CO_2 emissions.

Enflex

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
Energy-Consumption and Load Management

Description

Due to the increasing share of renewable energy generation (wind, photovoltaics), electricity prices are becoming increasingly volatile over the course of the day (intraday). The Enflex application enables users to reduce energy costs by planning the deployment and operating modes of flexible consumers in production in such a way that price fluctuations can be exploited. Various types of consumers can be taken into account, including production machines, technical building services (e.g. heat pumps or ventilation systems), as well as local on-site generation. It is advantageous to describe the input and output data for optimization in a standardized way (AAS) and to exchange them via standardized interfaces. The demonstrator shows the application of Enflex on selected consumers at the Siemens Motor Factory in Bad Neustadt.

Challenges

With the help of the data space, the various input data from external and internal sources—such as production planning data, energy signatures of manufacturing steps, flexibility constraints of variable consumers, as well as energy price, weather, and load forecasts—can be described and exchanged in a standardized manner. This reduces the initial configuration effort and improves communication flows both within production and with external partners.

User Benefits

Enflex enables energy costs to be reduced by optimizing the execution times of (production) processes and the operation of variable consumers while taking fluctuating energy prices into account. At the same time, components of electricity costs such as peak load charges or atypical grid usage can be considered. Own on-site generation capacity can also be included, allowing Enflex to make an effective contribution to decarbonization.

Contact

Jörn Peschke
joern.peschke@siemens.com
www.factory-x.org

Further information

Load Management

Demonstrator Type

- ☐ physically
- ☒ virtual

MX-Port

- ☒ Hercules
- ☒ Leo
- ☐ Orion

Use Case

Energy-Consumption and Load Management

Description

Load management uses data from production and from the building energy management system to determine the optimal strategy for energy usage at the grid connection point. This allows power peaks to be smoothed and additional charges to be avoided. Furthermore, by integrating production data, negative impacts on critical paths are prevented. Data storage is handled within the Asset Administration Shell. MX-Port Leo is used for internal communication, while MX-Port Hercules is used for communication with external parties.

Challenges

Through the data space, interfaces are standardized, which simplifies internal communication flows. In addition, communication with external partners—such as energy companies—can be realized using data space technology in a way that ensures control over the data remains with the load management user, thereby preventing critical data from being transferred to third parties.

User Benefits

By avoiding power peaks at the grid connection point and optimizing local energy flows, energy costs can be reduced. In addition, further business models may emerge from communication with energy companies, as they are willing to offer financial compensation in exchange for accurate data on the expected consumption of the industrial company.

Contact

Arne Martin
arne.martin@iosb-ast.fraunhofer.de
www.factory-x.org

Further information

https://www.iosb-ast.fraunhofer.de/de/abteilungen/kognitive-energiesysteme.html

Uhlmann FX Demonstrator (Production Site Laupheim) –Component -Specific CO_2 Footprint Determination on Production Equipment

Demonstrator Type
- [X] physically
- [X] virtual

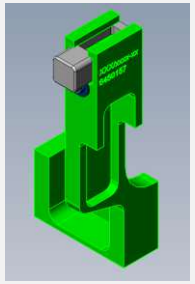
MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Product Carbon Footprint

1. Primary aluminium blank - Raw material

2. Planned operation time, Setup time, machine time, Production order

3. Produced Product: Product loader plunger



Transport: Route km, CO2e TKm

CO2e

4. Total Peace PCF Result in BOM

Contact

Thomas Sievers
Sievers.t@uhlmann-group.com
www.factory-x.org

Description

This demonstrator shows how the Product Carbon Footprint (PCF) of an individual component can be made available along the value chain—from the delivery of raw materials to the finished part that is installed in a Uhlmann packaging machine—by means of digitally shared data across company borders and systems.

The demonstrator is a fully productive DMG MORI milling machine in the Uhlmann production site in Laupheim with hardware & software solutions of further project partners.

Challenges

(1) No MES in place – without an MES, order and process data are not consistently captured and linked automatically, making it hard to allocate consumption to a specific part.
(2) Manual data discovery and consolidation – the required data must first be identified and compiled from existing sources; in some cases, consumption data is only accessible via alternative sources (e.g., billing or internal cost allocation).
(3) Technical prerequisites had to be established first – metering and IT/OT foundations for capturing and transmitting energy data (e.g., meters, interfaces, energy management software) had to be installed and commissioned before reliable energy data could be used for allocation

User Benefits

The Use Case enables a standardized, comparable and increasingly automated PCF calculation by structuring data inputs and connecting them with LCA models and reporting tooling—so results become repeatable and scalable across parts.

This improves PCF transparency for customers and supply-chain partners and supports responding to concrete customer sustainability requests with consistent, shareable PCF evidence

Combined Demonstrator of holistic PCF calculation across the supply chain

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☒ Hercules
- ☐ Leo
- ☐ Orion

Use Case
Carbon Footprint Management

Description

We show the calculation of the product carbon footprint (PCF) of a component across an examplary supply chain. This demonstrator combines three different factors that make up the PCF:

- Logistics carbon footprint
- PCF of components and resources
- Carbon footprint of own production

The demonstrator combines three different possibilities of PCF calculation: periodic calculation, real-time production driven calculation with and without the use of an MES

Challenges

- Large number of measurement points necessary, that then need to be broken down to product level
- High amount of personnel to collect data from manufacturing & logistics
- Need for the exchange of information with a multitude of suppliers across the supply chain
- Need for representative secondary data

User Benefits

Users benefit from the developments in three different ways:

- PCF relevant data from own production can be collected automatically, reducing data collection needs if system is setup holistically
- Logistics carbon footprints can be calculated and exchanged according to a common standard (iLeap/GLEC), ensuring comparability and replacing manual calculation
- PCFs can be exchanged between Data Ecosystem Participant according to a standardized ruleset, improving data quality & primary data while reducing dependency on secondary data

Contact

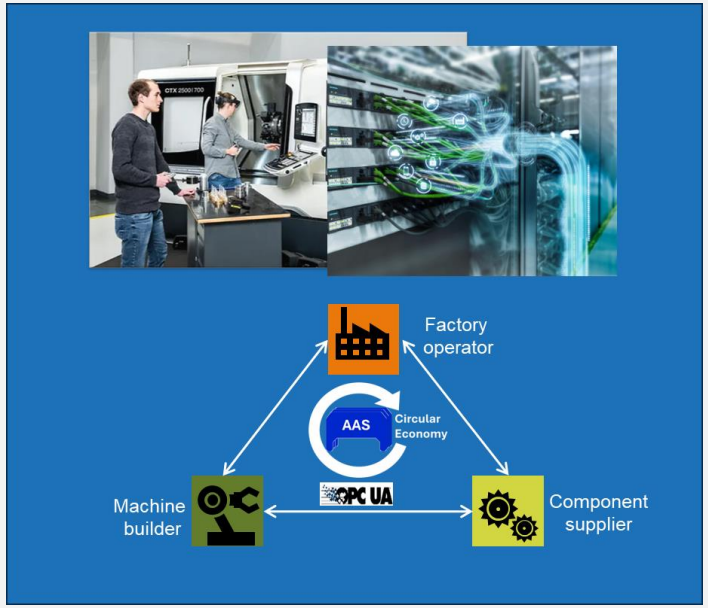
Lucas Fochler
Lucas.Fochler@estainium.eco
www.factory-x.org

Circular Economy for machine tools - Close the Loop – for a Second Life!

Demonstrator Type
- [X] physically
- [X] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Circular Economy



Description

The demonstration machine in Dresden is a productive machine with multiple processes for part production:
- Constant reconditioning of machines and components
- IT infrastructure available (AAS and OPC UA)
- Skilled process engineers
- Triggered high-frequency data acquisition by and condensated, anonymized interoperable data aggregation

Challenges

Cost and scaling of circular economy in machine businesses:
- Linear industry: take, make, waste
- Time and resource intensive manual processes
- Experienced based evaluation
- Very little automation and only a few standards in practice

User Benefits

Data-based situation assessment of machine and its components:
- Data-based situation assessment of machine and its main components directly in Dresden
- Business triggered condition assessment of machines and main components
- Data transmission based on MX-Port Leo and standardized AAS sub models for Circular Economy

Contact

Dr. Dominik Rohrmus
Dominik.rohrmus@siemens.com
www.factory-x.org

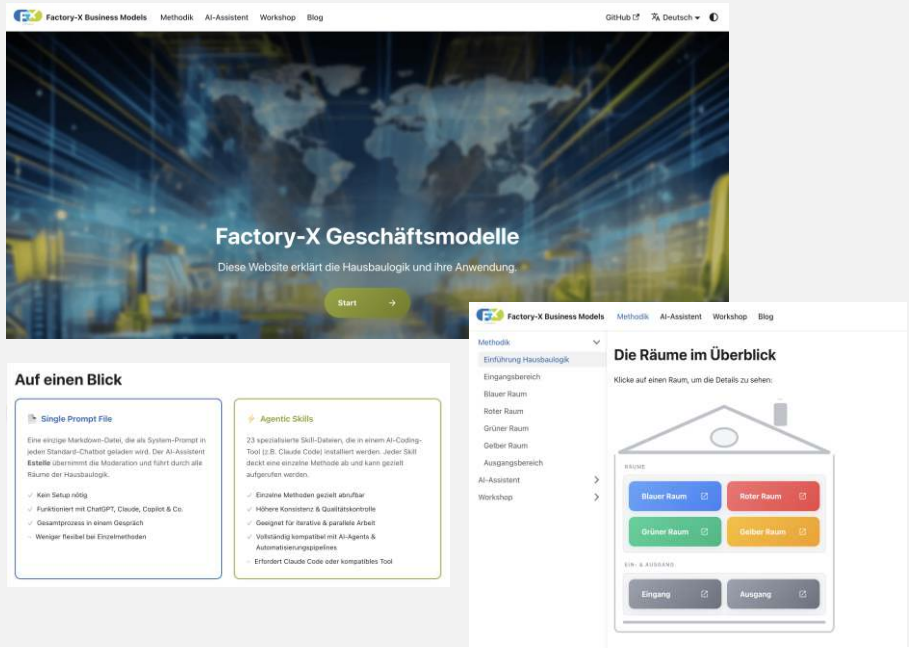
Further information
https://factory-x.org/use-case/tp-2-11-circular-economy/

House-building Logic Website

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☐ Leo
- ☐ Orion

Use Case
/



Description

The House-Building Logic (HBL) is a structured process for developing data-driven business models, specifically designed for industrial companies in mechanical and plant engineering. Across five sequential rooms, you answer all central questions of your business model: from customer analysis and value proposition to feasibility and profitability. The outcome is a business model that can serve as a solid basis for decisions.

Challenges

Industrial companies generate enormous amounts of machine data every day, yet most of it remains unused. Classic frameworks like the Business Model Canvas show what a business model needs, but not how to develop one. Teams face an empty canvas with no clear starting point, and pure hardware sales are no longer economically sufficient.

User Benefits

- Structured process instead of a blank canvas: clear steps with concrete methods
- Built-in Quality Gates after each room ensure progress and completeness
- Flexible application: classic workshop, AI-assisted, or hybrid approach
- Tailored for Factory-X / Manufacturing-X data ecosystem contexts

Contact

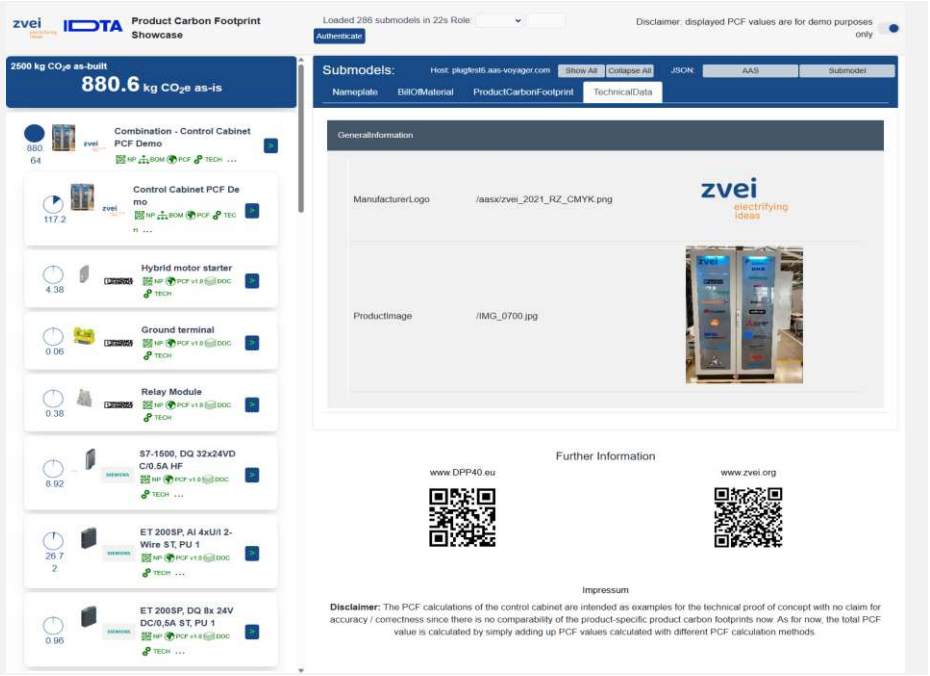
Gunter Deppner
gunter.deppner@sap.com
www.factory-x.org

PCF Showcase Realized With MX-Port Leo
Technology Demonstrator

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☐ Hercules
- ☒ Leo
- ☐ Orion

Use Case
MX-Port Leo
ZVEI PCF Showcase



Contact

Peter Amon
p.amon@siemens.com
www.factory-x.org

Description

The PCF Showcase realized with MX-Port Leo is a technology demonstrator that illustrates how product carbon footprint information can be collected and processed in an industrial context. It features a client application that calculates the product carbon footprint (PCF) of a control cabinet by aggregating environmental data from its individual components. The required information is retrieved from multiple component suppliers using the discovery and security mechanisms provided by MX-Port Leo. All exchanged information is structured using standardized AAS Submodels, enabling consistent interpretation, interoperability, and efficient integration of carbon footprint data across different suppliers and systems.

Challenges

Key challenges include efficiently calculating product-related CO_2 footprints across the entire value chain by automatically retrieving data from multiple component suppliers, dynamically discovering the relevant suppliers based on asset information such as ID Links, and ensuring that all exchanged information is transmitted securely and only made accessible to authorized data consumers.

User Benefits

The benefits of the solution realized using MX-Port Leo come from interoperability on the following layers:

- Unified data model provided by the Asset Administration Shell
- Unified discovery based on the MX-Port Leo's Company Lookup service
- Unified authentication and authorization based on MX-Port Leo's FX Token and Trusted Partner List

Consistent, smart, interoperable: MX Port Leo for AAS-based data exchange

Demonstrator Type
- [X] physically
- [ ] virtual

MX-Port
- [ ] Hercules
- [X] Leo
- [ ] Orion

Use Case
Cross-Use Case

Description

The demonstrator shows how end-to-end continuity and interoperability can be achieved in the areas of Smart Products, Smart Engineering, Smart Production, Smart Operation, Smart Services, and Smart End of Life using the AAS-based MX-Port ‘Leo’. Along the product lifecycle, the demonstrator uses several use cases to show how companies can collaborate effectively through standardized data usage.

Challenges

Production processes are increasingly digitally networked and based on intelligent technology. Equipment is being digitally upgraded and becoming ‘smart,’ which creates significant added value for design, use, and maintenance throughout its entire product lifecycle. However, it also means that equipment needs to be updated on a regular basis across manufacturers and suppliers, which requires interoperability.

User Benefits

The MX-Port Leo is based on AAS technology and serves as the communication standard for cross-manufacturer, unified data exchange. The AAS accompanies the product as a digital twin throughout its entire lifecycle. This technology enables the connection of all products, processes, and stakeholders within the Factory-X digital ecosystem. It offers the opportunity to optimize production processes, reduce dependency on skilled workers, increase efficiency, and enable new business models. Ultimately, the benefits are lower costs and the ability to respond flexibly to market changes and secure their long-term capacity for innovation.

Contact

Dr. Laura Schelenz
laura.schelenz@fe-zvei.org
www.factory-x.org

Further information

XR – Cross Reality Demonstrator: The Haptic Data Space Experience

Demonstrator Type
- ☐ physically
- ☒ virtual

MX-Port
- ☒ Hercules
- ☒ Leo
- ☒ Orion

Use Case
Cross-Use Case

Description

The XR platform provides an interactive digital experience that uses video and manual interaction to encourage active participation and facilitate the retention of information over the long term. It is highly flexible and can be used in various locations with ease.

The XR platform is also highly scalable. As it does not require physical contact for deployment, it can be rolled out easily all over the world.

Challenge – Making Innovation and Complexity understandable

Complex and highly innovative topics are difficult to explain adequately using existing, predominantly linear formats. Presentations, texts, and videos quickly reach their limits: content becomes abstract, relationships remain unclear, and confusion often replaces understanding. Pure information delivery is not sufficient to enable deep comprehension and lasting insights.

Cross Reality offers a significant advantage in this context. By simultaneously engaging multiple senses – sight, sound, and haptics – learning becomes an experiential process. Content is delivered spatially, tangibly, and within context. Users can actively explore complex topics, experience rather than merely consume them, and intuitively grasp relationships. As a result, engagement increases and, most importantly, the level of understanding rises significantly, as true understanding is created through experience.

User Benefits – Long-Lasting Learning

The XR platform provides brief insights into all eleven use cases and the Manufacturing-X environment – including the MX-Ports and projects. Using XR glasses and immersive, controller-free manual interaction increases interest in trying them out. The demonstrator helps target groups access and understand key information on a specific topic, enabling them to retain it in the long term.

The XR glasses are compact and lightweight, making them easy to carry around and use flexibly in various locations. There are no costly transport or logistics costs involved.

Contact

Anja Simon
info@lni40.de
www.factory-x.org

Further information

Thank you

Contact information:

info@factory-x.org

www.factory-x.org