



Factory-X

Customer Sounding Board
October 23, 2024

PART OF



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NextGenerationEU

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on the basis of a decision
by the German Bundestag

Agenda

Topics and Presenters



Topic	Presenter
Welcome, Introduction & Moderation	Silke Huesmann Roland Rosen  
Factory-X Use Case Overview	Ulrich Löwen 
Use Case 2.02 “Information Update and Change Service” <ul style="list-style-type: none">• Horizontal data logistics• Vertical data logistics	Frank Wolter 
Use Case 2.08: “Traceability”	Christian Haink 
Discussion & Closing	All

After each presentation, we have time for questions

Factory-X

The Digital Ecosystem for
Factory Outfitters and Operators

Factory-X is a Lighthouse Project for Manufacturing-X



- Building the **open** and **collaborative digital ecosystem** for Factory Outfitters and Operators upon Catena-X and concepts of Platform Industry 4.0
- Focus on **11 dedicated use cases** to extend the existing horizontal supply chain-oriented use cases and add vertical use cases to integrate the operation of shop floors
- Under the leadership of Siemens and SAP, **47 partners** are working together in this strong consortium, supplemented by **10 associated partners** (companies, associations and research institutions)
- **Manufacturing-X wide coordination** and establishment of an **international Manufacturing-X network**
- Project started on February 1st, 2024
- Completion of Project by June 2026

Factory-X Partners

- | | | |
|--------------------------------------|--------------------------------|--|
| • August Wilhelm Scheer Institut | • inovex | • Scheer GmbH |
| • BASF | • InstaWerk | • SCHUNK |
| • Berger Holding | • ISW - Universität Stuttgart | • SDFS Smarte Demonstrations-fabrik Siegen |
| • Catena-X e.V. | • Lenze | • SICK |
| • Codewerk | • LNI e.V. | • Siemens |
| • DMG MORI | • Matchory | • SmartFactory-KL e.V. |
| • Empolis | • MT Analytics | • soffico |
| • EPLAN | • Open Industry 4.0 Alliance | • Software AG |
| • Estainium | • Pakic | • TRUMPF |
| • Eviden | • Phoenix Contact | • T-Systems |
| • Festo | • prenode | • TÜV SÜD Chemie Service |
| • Fraunhofer | • proALPHA | • Uhlmann Group |
| • German Edge Cloud | • RIF Engineering & Consulting | • VDMA e.V. |
| • Hilscher | • Ruhr-Universität Bochum | • WITTENSTEIN |
| • ifm diagnostic | • SAP | • ZVEI e.V. (FE) |
| • IFW - Leibniz Universität Hannover | | |
| • igus | | |

Factory-X Associated Partners

- | | | |
|--------------------------|----------------------|-------------|
| • ARENA2036 e.V. | • Digital Data Chain | • VDE e.V. |
| • Arvato Systems Digital | • IDTA e.V. | • ZVEI e.V. |
| • Bayern Innovativ | • Robert Bosch | |
| • Beckhoff Automation | • Sharecat Solutions | |

Factory-X goes public

Registrierung über <https://factory-x.org/>



Manufacturing-X Technical Council

Was ist das Manufacturing-X Technical Council?

- Factory-X verfolgt die Zielsetzung unter Verwendung von Ergebnissen von Catena-X eine IT/SW-technische Basis (den „Factory-X Kernel“) für Software-Lösungen in Manufacturing-X zu schaffen.
- Im M-X Technical Council werden die Ansätze – entsprechend des Projektfortschrittes – vorgestellt und zu Feedback eingeladen.

Für wen ist es?

- Das Manufacturing-X Technical Council richtet sich an alle, die Interesse an der Anwendung des IT/SW-technischen „Factory-X Kernels“ haben, z.B. für die Realisierung eigener Software-Lösungen im Rahmen Manufacturing-X.

Wann? 2. MX TC ist am 24.10.24

Customer Sounding Board

Was ist das Customer Sounding Board?

- In Factory-X werden für 11 Use Cases verschiedene sogenannte Business Applikationen (Software-Lösungen) konzipiert, prototypisch entwickelt und validiert.
- Im Rahmen des Sounding Board werden diese – entsprechend des Projektfortschrittes – vorgestellt und zu Feedback eingeladen.

Für wen ist es?

- Das Customer Sounding Board richtet sich an alle, die Interesse an der Anwendung, z.B. Erprobung, der Business Applikationen haben oder eigene, zu Factory-X interoperable Software-Lösungen erstellen wollen.

Wann? 2. CSB Jetzt!

Wie geht es weiter?

Weitere MX TC und CSB werden folgen und wir streben direkten Austausch an! Ggf. über NDAs.

Factory-X

Introduction to Factory-X Use Cases

Overall Architecture of Factory-X: The Digital Ecosystem for Factory Outfitters and Operators



Resilience

Sustainability

Competitiveness

Digital Products and Services

Everything as a Service

**Product Innovation
Collaboration**

**Production Optimiz. /
Autonomous Factory**

**Supply Chain
Transparency**

**Energy & CO₂-
Management**

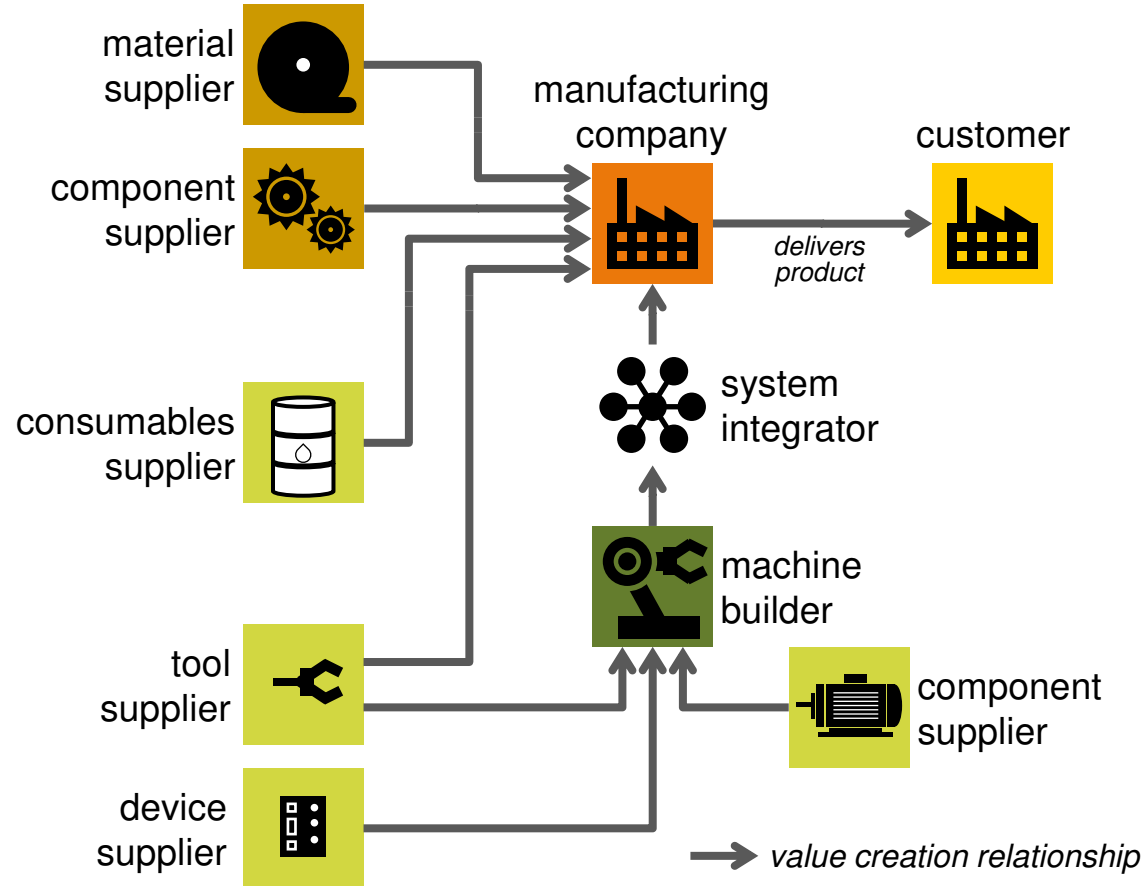
Shared services

Shared technological base layer

Regulatory Framework and Standards

Supply Chains in Manufacturing Industries

Illustration

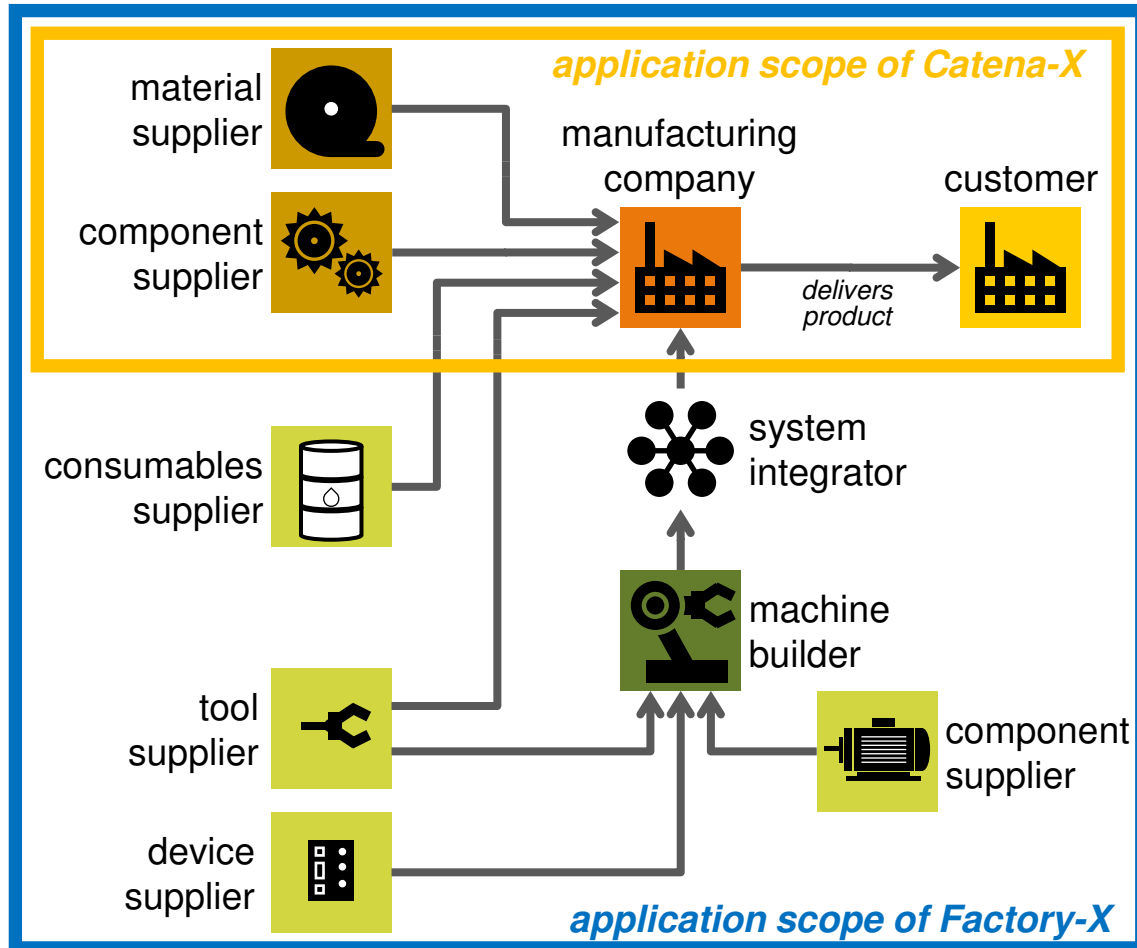


From the perspective of a manufacturing company, there are two different supply chains:

- Supply chain regarding the **product** of the manufacturing company
 - All deliveries from suppliers that are **integrated** into the manufacturing company's product
 - Application scope of Catena-X
- Supply chain regarding the **production system** of the manufacturing company
 - All deliveries from suppliers that are needed to **build** and **operate** the manufacturing company's production system
 - Expansion of application scope of Catena-X by Factory-X

Supply Chains in Manufacturing Industries

Illustration



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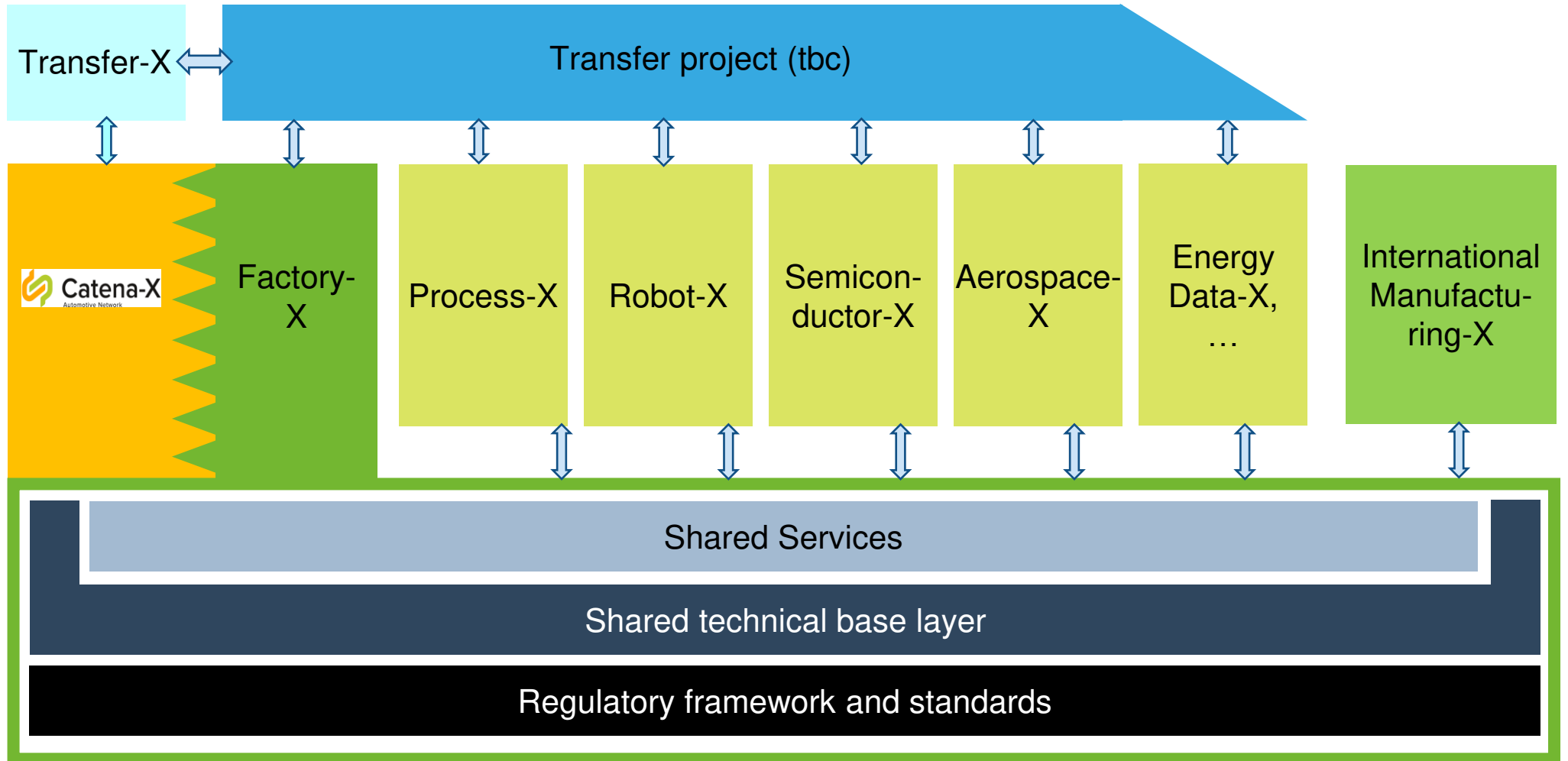
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Factory-X Kernel












Systemic approach to „Manufacturing-X“



Including SME and additional sectors



11 Use Cases of Factory-X

<p>11 Use Cases for horizontal and vertical data transfer</p>	<p>Integrated Toolchains and Collaborative Engineering</p> 	<p>Information Update and Change Service</p> 	<p>Collaborative Information Logistics</p> 
<p>Condition Monitoring led Services</p> 	<p>Modular Production</p> 	<p>Manufacturing as a Service - On Demand Manufacturing</p> 	<p>Autonomous Operation-as-a-Service</p> 
<p>Traceability</p> 	<p>Energy-Consumption and Load Management</p> 	<p>Carbon Footprint Management</p> 	<p>Circular Economy</p> 

Factory-X Kernel & Basis Services

UC 2.02

Information Update and Change Service



Challenge

- Transparency and consistency regarding updates of information and software

Goal

- Solutions for automated and reliable update services and common device management

Use Case 2.02 Information Update and Change Service



Task and challenge

robot control

servo drives

optical sensors

control units for process
modules



machine control (PLC)

security router

managed switch

energy measurement system

network-compatible UPS

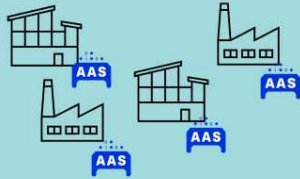
1 Machine ⇒ 30 network-compatible devices ⇒ from 20 different manufacturers

Task and challenge for OT security: up-to-date firmware on all devices!

Use Case 2.02 Information Update and Change Service

Mission & Vision

Provision of data



Implement standardized interfaces and play out standardized data containers



This challenge can only be solved together

Horizontal data infrastructure

Asset management



selection, procurement and introduction of commercial software (by the IT department)



Each company solves this challenge individually

Transferring information to the individual devices



Implement standardized interfaces to organize updates to Ethernet-enabled devices!



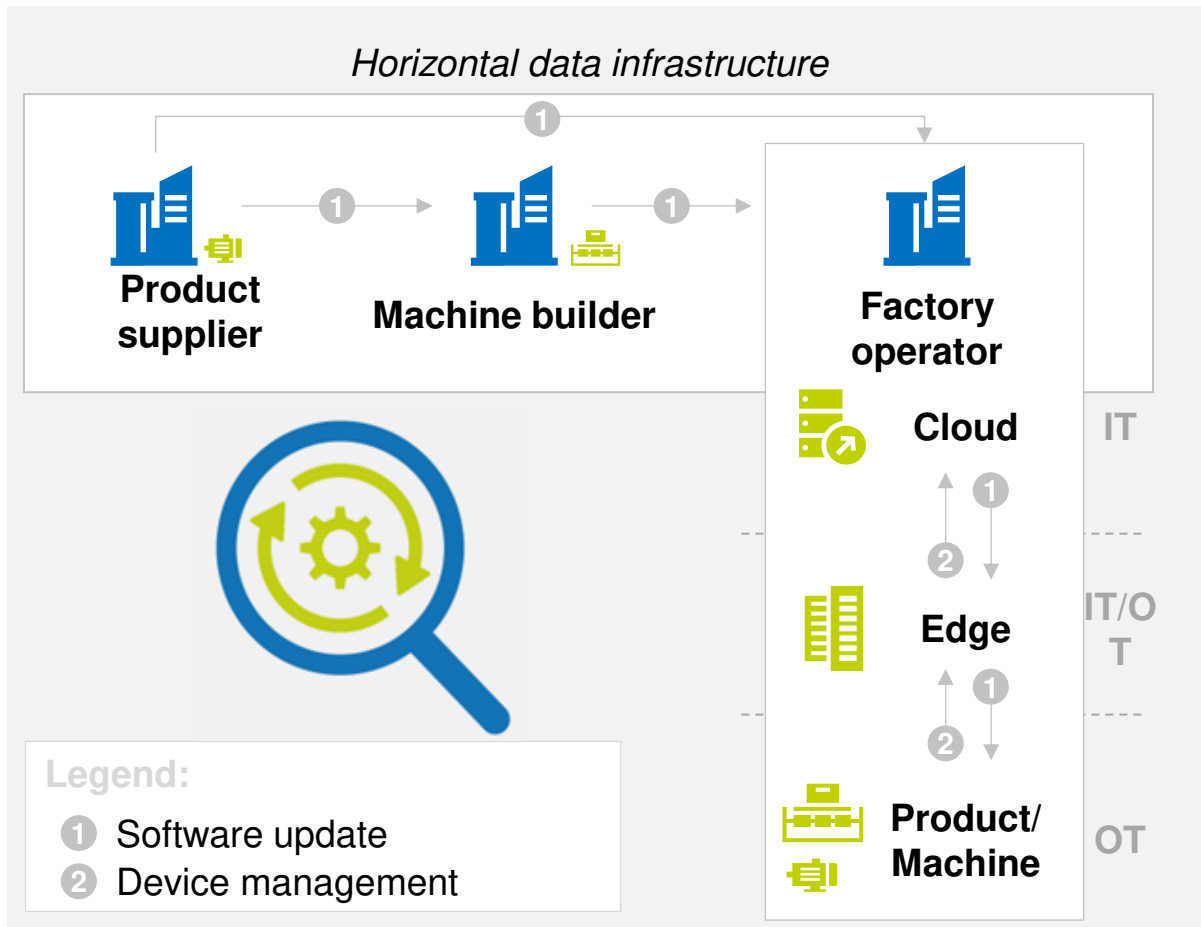
Solution modules for the update

Vertical data infrastructure

Use Case 2.2

Information Update and Change Service

Illustrating the use case



Description

Challenge

- Transparency and consistency regarding updates of information and software.

Goal

- Solutions for automated and reliable update services and common device management.

Solution approach

- Information on product and machine lifecycle.
- Standardized information and automated processes for software updates of products and machines.

Benefit for the user

- Consideration of many products from a high number of different suppliers and machine builders.
- Software update processes will be automated.
- Support for regulations like the “EU Cyber Resilience Act”,

UC 2.02 Information Update & Change Service

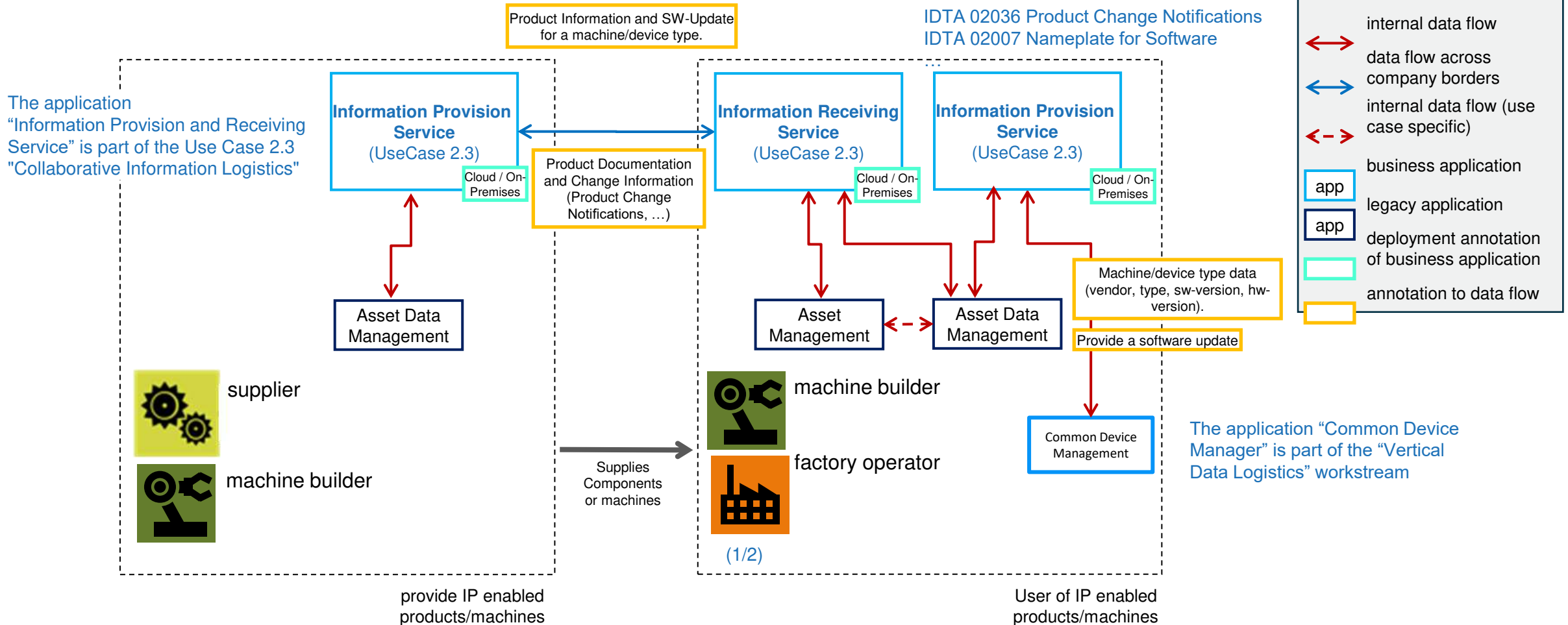
Horizontal data logistics

Use Case 2.02 Information Update and Change Service

Horizontal Data Logistics – Technical View

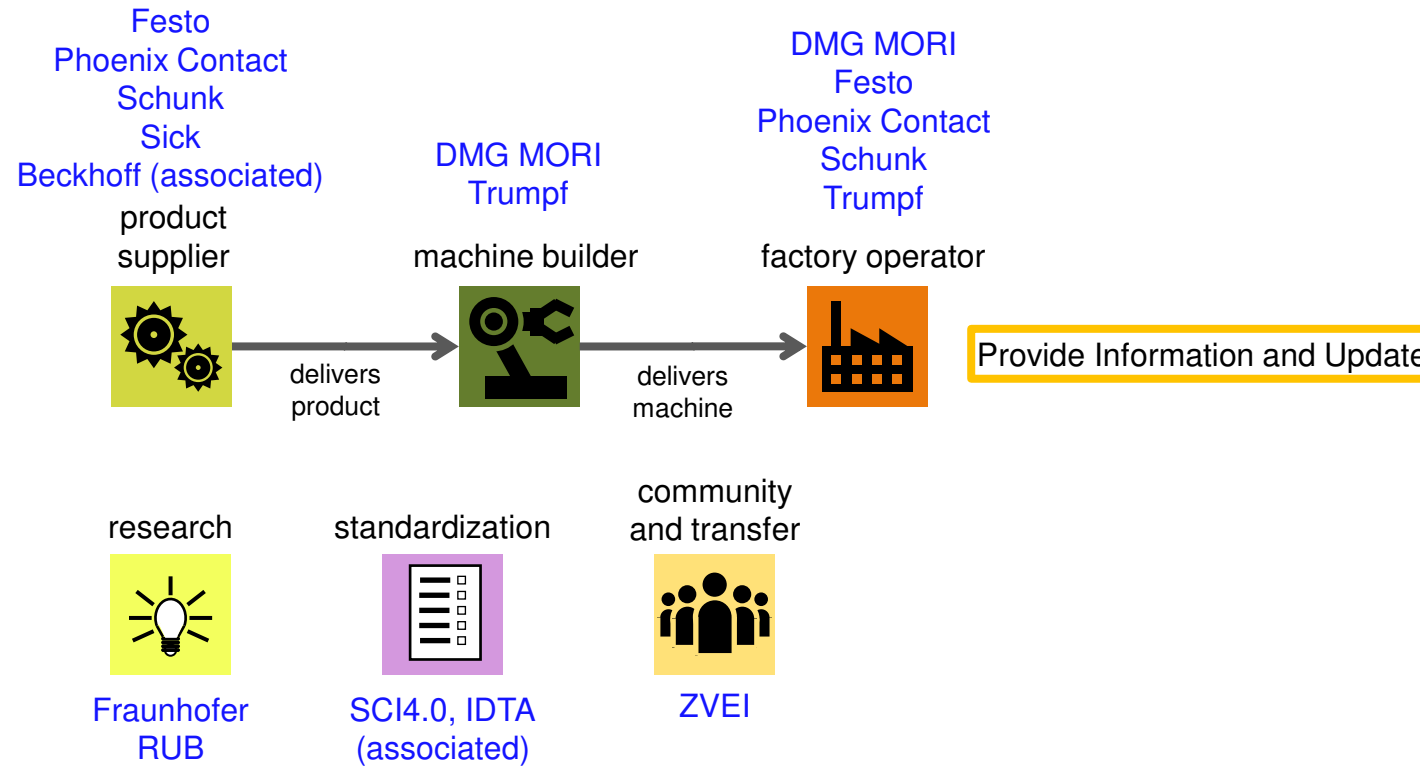
IDTA 02006 Digital Nameplate
 IDTA 02004 Handover Documentation
 IDTA 02003 Technical Data

IDTA 02036 Product Change Notifications
 IDTA 02007 Nameplate for Software



(1) Member of the Digital Ecosystem for Factory Outfitters and Operators (Factory-X)
 (2) Participants in a private data room with Basic Factory-X mechanisms

Use Case 2.02 Information Update and Change Service Horizontal Data Logistics – Business View



business view

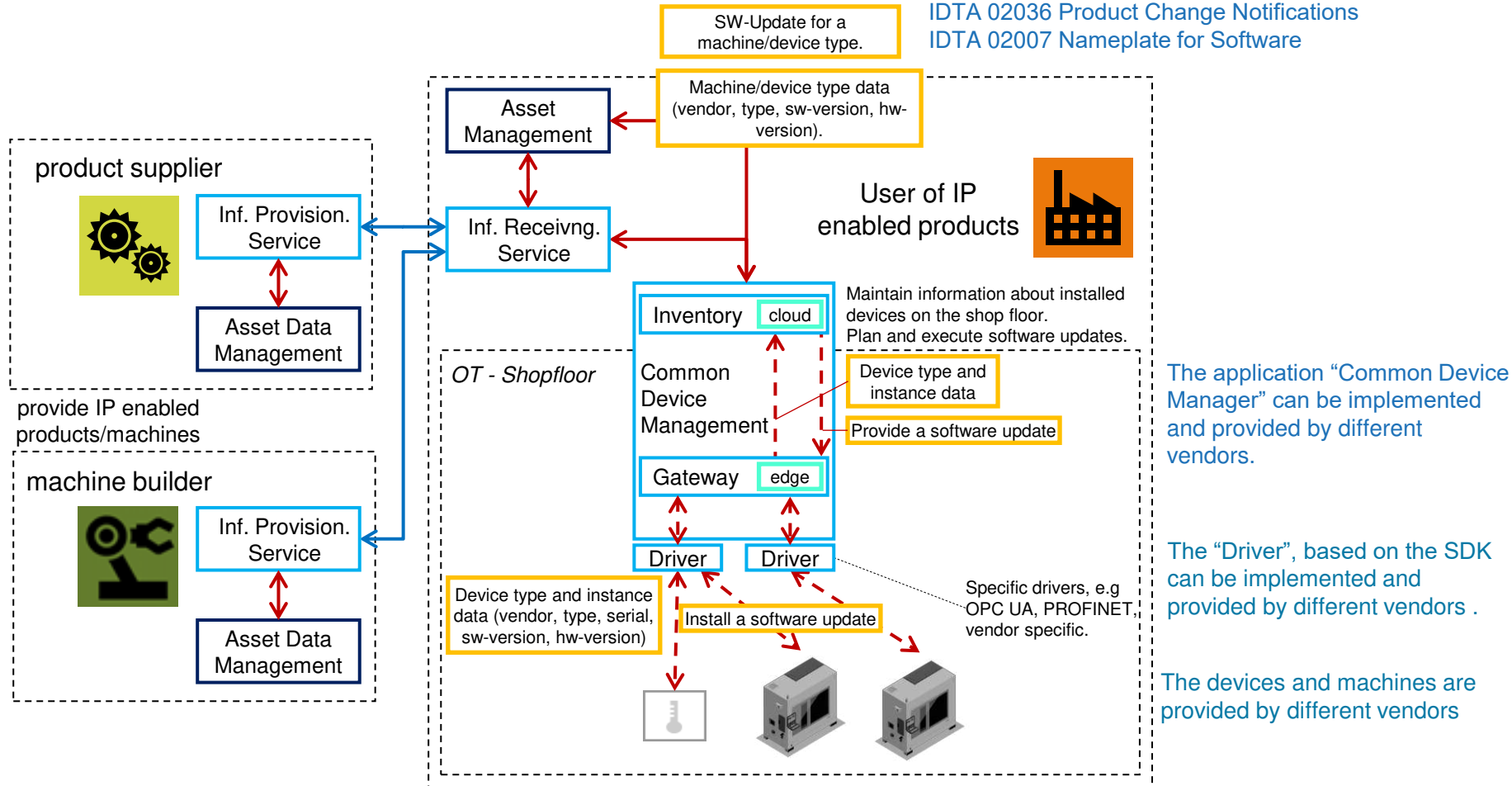
- provides physical product
- provides business app./SDK

UC 2.02 Information Update & Change Service

Vertical data logistics

Use Case 2.02 Information Update and Change Service Vertical Data Logistics – Technical View

IDTA 02006 Digital Nameplate
IDTA 02036 Product Change Notifications
IDTA 02007 Nameplate for Software



usage view

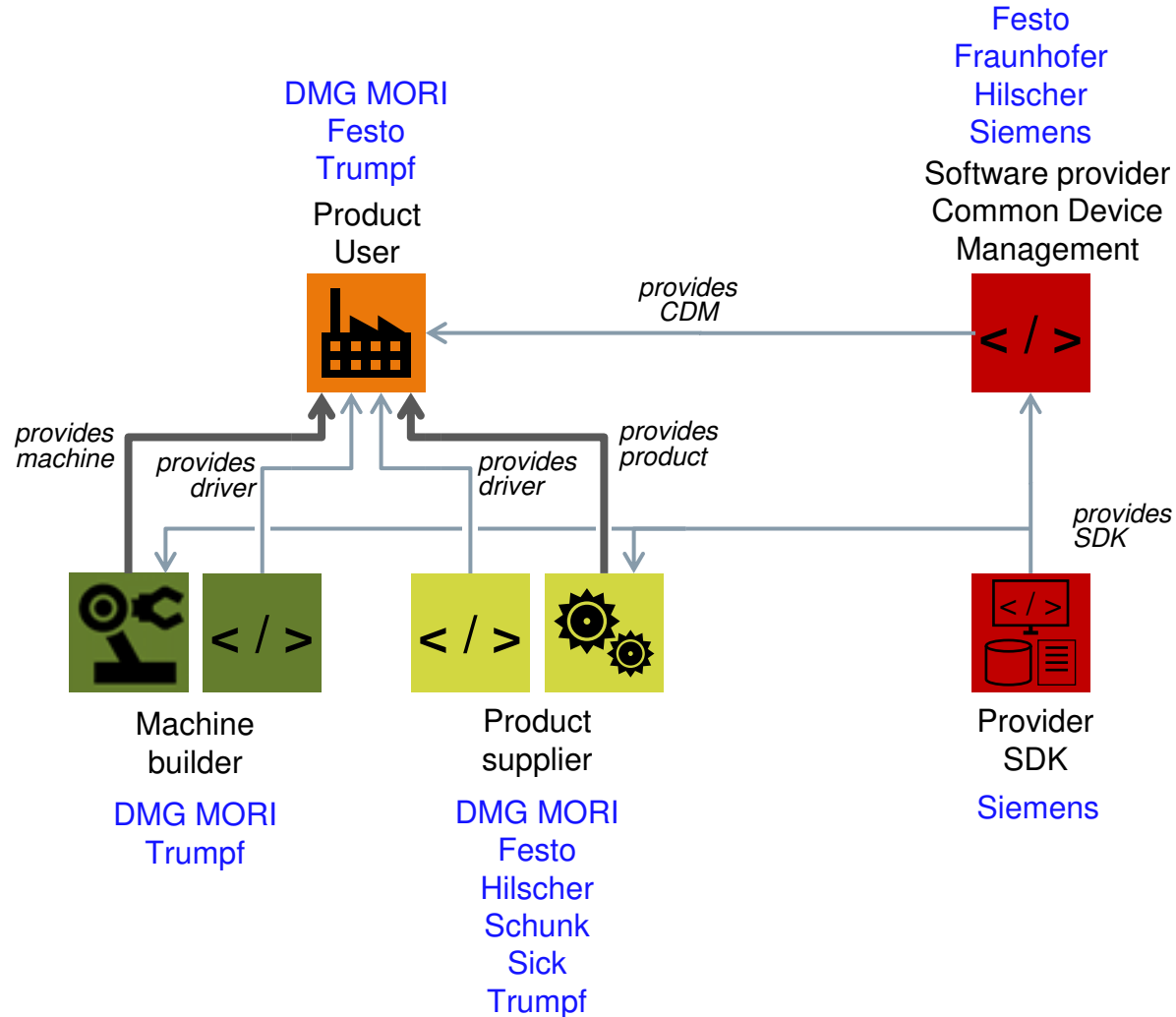
- internal data flow
- data flow across company borders
- internal data flow (use case specific)
- app business application
- app legacy application
- deployment annotation of business application
- annotation to data flow

The application “Common Device Manager” can be implemented and provided by different vendors.

The “Driver”, based on the SDK can be implemented and provided by different vendors .

The devices and machines are provided by different vendors

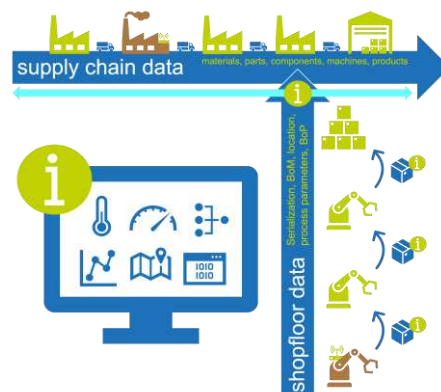
Use Case 2.02 Information Update and Change Service Vertical Data Logistics – Business View



business view

- provides physical product
- provides business app./SDK

UC 2.08 Traceability



Challenge

- Traceability of data within a factory and across the supply chain

Goal

- Solutions for management of history and usage of material, parts and products

Factory-X Use Case Traceability

Descriptive Means for different audiences and purposes



One Pager

Traceability
Trace Today, Trust Tomorrow!

Späte Erkennung von Schwachstellen oder Qualitätsmängeln führt zu hohen Kosten. Durch den kollaborativen Datenaustausch haben alle Beteiligten – von der Rohstoffbeschaffung bis zur Auslieferung – kontinuierliche Kontrolle und Transparenz. Dies ermöglicht eine effiziente Optimierung der Qualitätskosten und reduziert Fehlerkosten entlang der gesamten Lieferkette.

Die FX-Lösung im Detail

- Rückverfolgbarkeit und Dokumentation aller Produkt- und Prozessdaten über den Lebenszyklus
- Transparente Stückliste über Planung, Fertigung, Wartung
- Volle Transparenz über die Herkunft und Verwendung der Teile für alle Teilnehmer der Wertschöpfungskette

Ihr Nutzen

- Fehler und Ausschuss reduzieren:** Durch umfassende Dokumentation der Prozessparameter können Sie bei Endproduktfehlern schnell erkennen, ob Prozessgrenzen überschritten wurden. Das verringert Fehlerquellen und optimiert die Qualität, was Ihre Produktionskosten senkt.
- Gezielte Maßnahmen ergreifen:** Die lieferkettenübergreifende Rückverfolgbarkeit ermöglicht es Ihnen, bei Produktproblemen präzise Ursachen zu identifizieren und gezielte Maßnahmen zu ergreifen. Dies führt zu schnelleren Problemlösungen, reduziert Kosten und stärkt Ihre Wettbewerbsfähigkeit.
- Wertschöpfungskette optimieren:** Volle Transparenz über die Herkunft und Verwendung der Teile für alle Beteiligten verbessert die Zusammenarbeit und Kommunikation entlang der Wertschöpfungskette. Das führt zu schnellerer Problemlösung und stärkt die Beziehungen zu Ihren Partnern, was Ihre Wettbewerbsfähigkeit erhöht.
- Kundenzufriedenheit erhöhen:** Durch konsequente Rückverfolgbarkeit und Prozessdokumentation gewährleisten Sie hohe Produktqualität und stärken das Vertrauen Ihrer Kunden. Dies erhöht die Kundenzufriedenheit und -bindung, was den Wert und Nutzen Ihrer Produkte und Dienstleistungen direkt erhöht.

Be informed and stay in touch!

"In this FX use case, we will develop a technical concept for seamless traceability, documenting relevant data throughout the asset lifecycle. By integrating comprehensive shopfloor data, we will enable future-proof Track & Trace applications that meet tightening regulations and enhance user benefits. Our goal is to set a new industry standard."

Statements and Testimonials

"In this FX use case, we will develop a technical concept for seamless traceability, documenting relevant data throughout the asset lifecycle. By integrating comprehensive shopfloor data, we will enable future-proof Track & Trace applications that meet tightening regulations and enhance user benefits. **Our goal is to set a new industry standard.**"
(Product Owner Use Case Traceability)

Animated Presentations and Short Videos

Traceability in Manufacturing:
Trace today - trust tomorrow!

My name is Collette and I will show you today, how traceability is revolutionizing manufacturing processes

All Data from production machines, materials, components is available

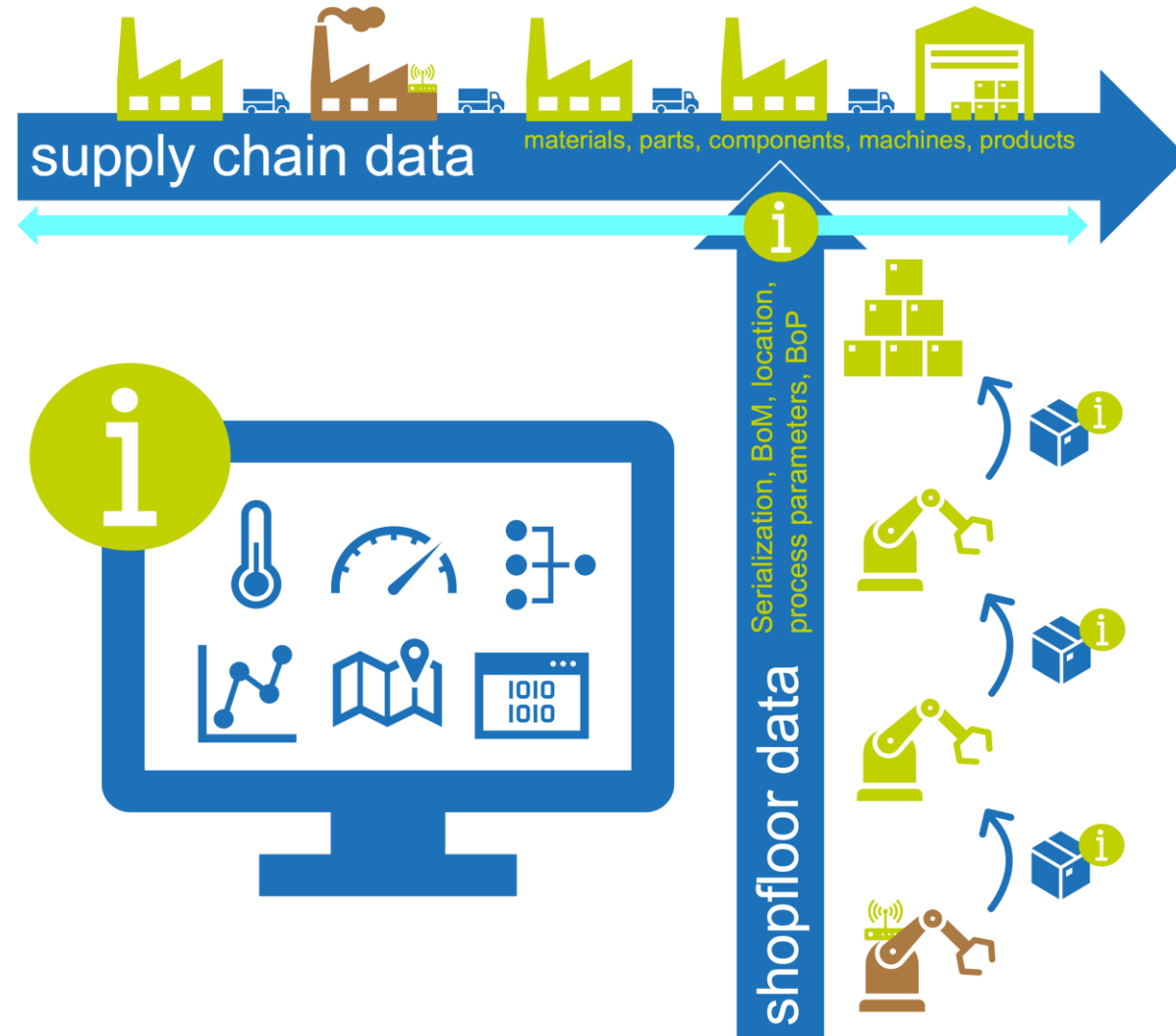
Connected through a standardized interface

XR-Demonstrator (Augmented Reality)

MACHINE BUILDER
FACTORY OPERATOR
ASSEMBLY & RETAIL

Thumb UpRight

Factory-X Use Case Traceability Simplified Illustration



Factory-X Use Case Traceability

We provide two classes of interoperable Business Applications

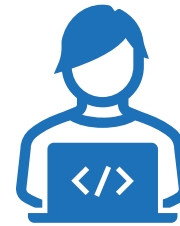


Product and Process Data

- Which parts have been used (BoM as built)
- Where do they originate from (Supply chain)
- What has been changed (BoM as maintained)
- How have they been produced (Conditions, BoP)

Localization of Assets (RTLS)

- Where is the asset (location)
- Where has the asset been, is it moving to (movement)



Factory-X Use Case Traceability

Focusing different Segments of the Value Creation Network

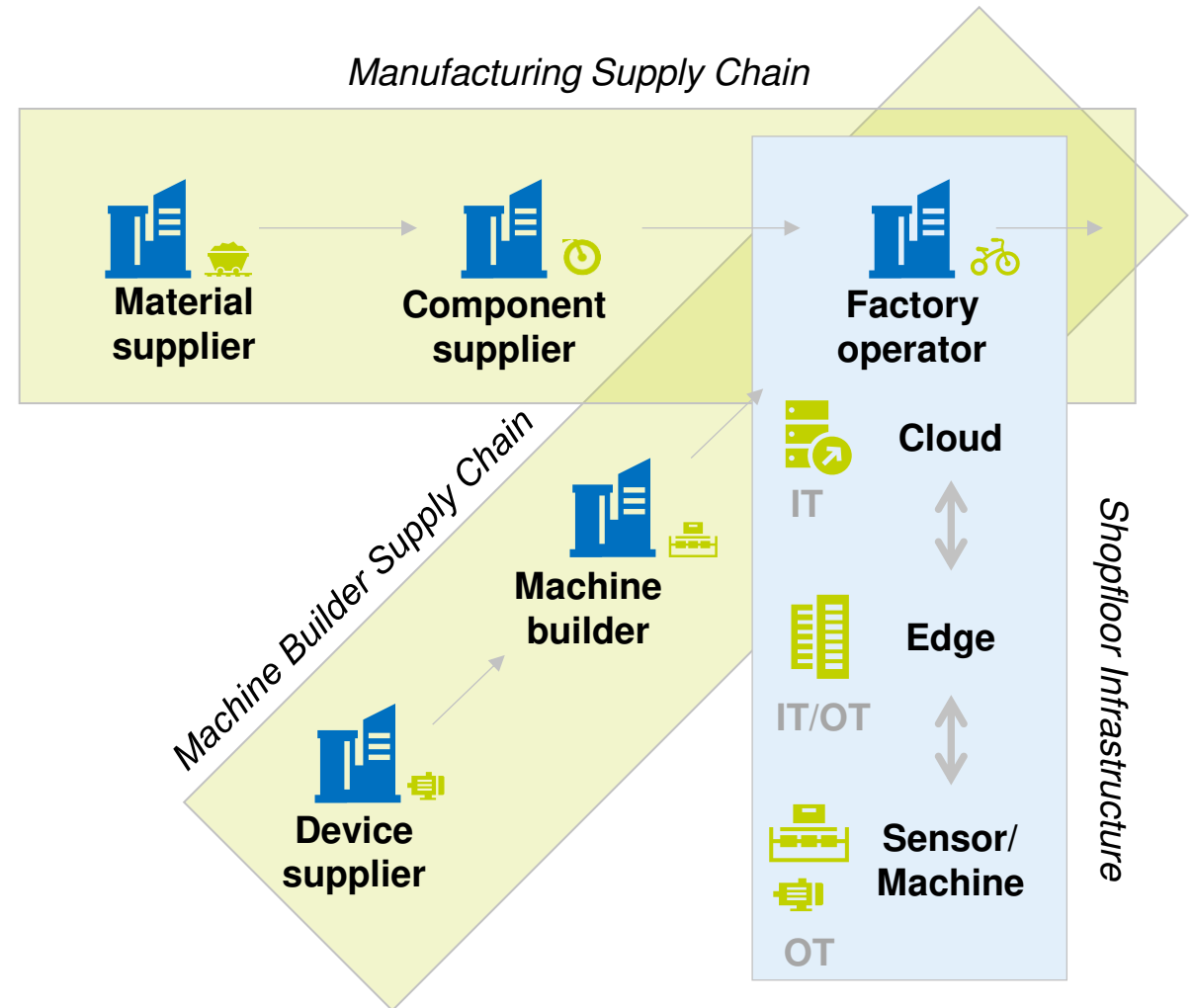


- The Manufacturing Supply Chain focusing the sourcing of material and components
- The Machine Builder Supply Chain focusing the value chain from component supplier and machine builder to factory operators
- The Shopfloor Infrastructure focusing IT/OT integration to document relevant process and product related information

Important Note concerning different abstraction levels of a machine:

A machine is - depending on the respective point of view - both a product being delivered and an OT component delivering process data.

In both cases linked with a digital twin being updated throughout its lifecycle.



Traceability in general offers great benefits, even greater in the Factory-X Ecosystem



1. End-to-End Transparency

Traceability applications provide visibility of materials and products across their entire lifecycle, **including precise localization**. This improves issue identification and resolution while fostering better decision-making and trust among supply chain partners.

2. Interoperability and Standardization

By using open and best practice standards, traceability applications will ensure seamless data exchange across connected systems, enabling efficient tracing of machine, product, and process data. Both intra-factory and across the supply chain.

3. Regulatory Compliance

Traceability applications will systematically capture and provide access to all necessary and relevant data, ensuring that companies can meet regulatory requirements and quality standards, while being ready for audits and investigations.

4. Improved Quality Control and Cost Reductions

Traceability applications will enhance the ability to quickly trace and address quality issues, helping to isolate defects and reduce the risk of recalls, thus improving overall product reliability and customer satisfaction. Including cost reductions in operations.

5. Data Security and Collaboration

Traceability applications will support secure data sharing while maintaining data sovereignty, ensuring that sensitive production data is protected and used according to agreed-upon rules in collaborative environments.

Scenarios we collected

Focus: Shopfloor data

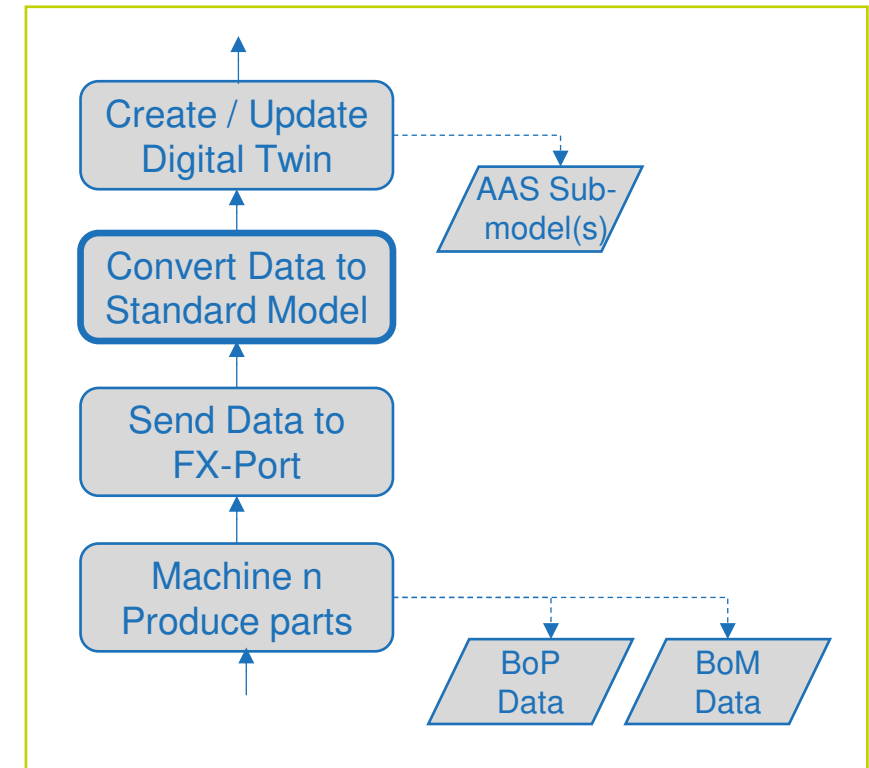


Documentation of product related data and allocation to the respective Digital Twin

- Quality investigation along the supply chain (cross company)
- Quality notifications along the supply chain (cross company)
- Machine Lifecycle Management (BoM View, as maintained)
- Machine Data Analysis and Reporting (Process Data; BoP View)

Simplified:

- Generation and update of asset data
- Pro-active and re-active data provisioning
- Static and dynamic data



Simplified excerpt – Transfer shopfloor data into DT

Factory-X Use Case Traceability

Our Guardrails



Interviews with the Target Group



Existing Standards / Best practices



Regulatory Requirements



ESPR

CSRD

CRA

Sustainable Product Strategy (EU)

Basic Assumptions Guidelines / Guardrails

And what we aim for



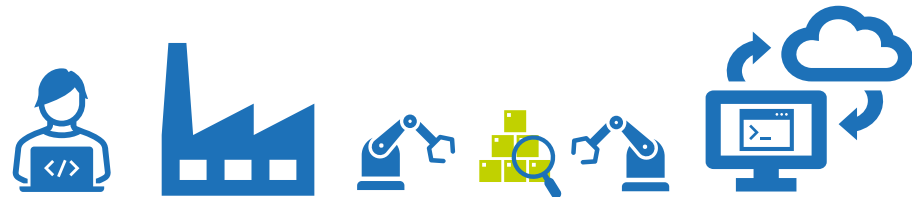
To ensure the success of our standardization efforts we will validate our concepts:

- with a reference implementation in the field / on the shopfloor
- with a reference implementation of realistic complexity

and aim to standardize existing best practices

Our reference implementation will not only be a demonstrator powered by simulators and data set generators.

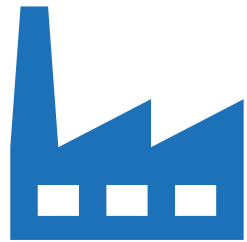
We will deliver an actual physical reference implementation with live working machines that produce parts and components, being tracked and traced.



Factory-X Use Case Traceability Reference Implementation



With the combined forces of all partners involved through delivering the facility of a test bed, infrastructure, machines, hard- and software.



Smart Factory
as Test Bed



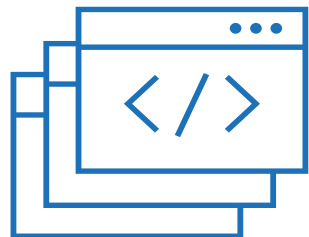
Bending machine
Trumpf TruBend 1100



2D laser cutting system
Trumpf TruLaser 1030



5-axis milling machine
DMG MORI DMU 40 PLUS



Product and Process Data
Traceability Business Applications



Real-time localization system
Coriva tags and satellites

Use your chance to be part of Factory-X

Bring in your Point of View through Expert Interviews



Target group: SME-like manufacturers with Traceability demands
Seize your opportunity to be part of the future industry standard!

Contact us to have a detailed interview for Traceability:
info@factory-x.org



Q & A

Thank you

Contact information:

info@factory-x.org

www.factory-x.org