FACTORY-X

Factory-X

Manufacturing-X Technical Council
July 10, 2024

PART OF MANUFACTURING-X

Funded by the European Union
NextGenerationEU

Supported by:
Federal Ministry for Economic Affairs and Climate Action
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Agenda
Topic and Presenter

Topic	Presenter
Welcome & Moderation	Silke Huesmann 
Factory-X Overview & Introduction	Roland Rosen 
Factory-X Integration Architecture	Guido Stephan 
The Value of the Dataspace Protocol	Arno Weiss 
Outlook	Guido Stephan 
Q & A	All

FACTORY-X

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

Factory-X Associated Partners

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

11 Use Cases of Factory-X

11 Use Cases for horizontal and vertical data transfer

Integrated Toolchains and Collaborative Engineering

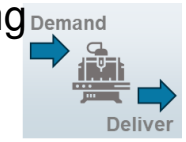
Information Update and Change Service

Collaborative Information Logistics

Condition Monitoring led Services

Modular Production

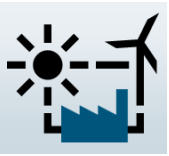
Manufacturing as a Service – On Demand Manufacturing



Autonomous Operation-as-a-Service

Traceability

Energy-Consumption and Load Management

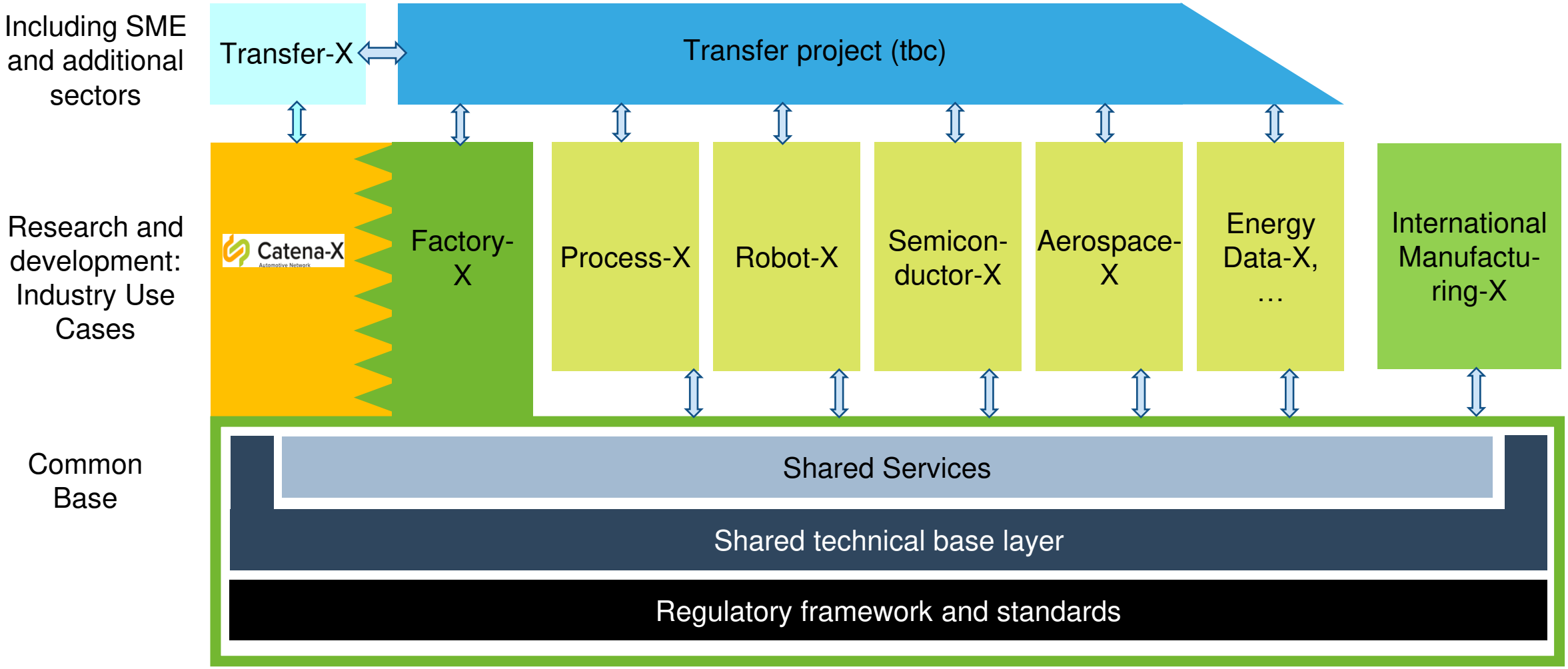


Carbon Footprint Management

Circular Economy

Factory-X Kernel & Basis Services

TP 4 Factory-X Kernel
Systemic approach to „Manufacturing-X“



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? Jetzt!

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? Dienstag, 16.07.24, 10:00 – 11:30 Uhr

Wie geht es weiter?

Weitere MX TC und CSB werden folgen und wir streben direkten Austausch an!

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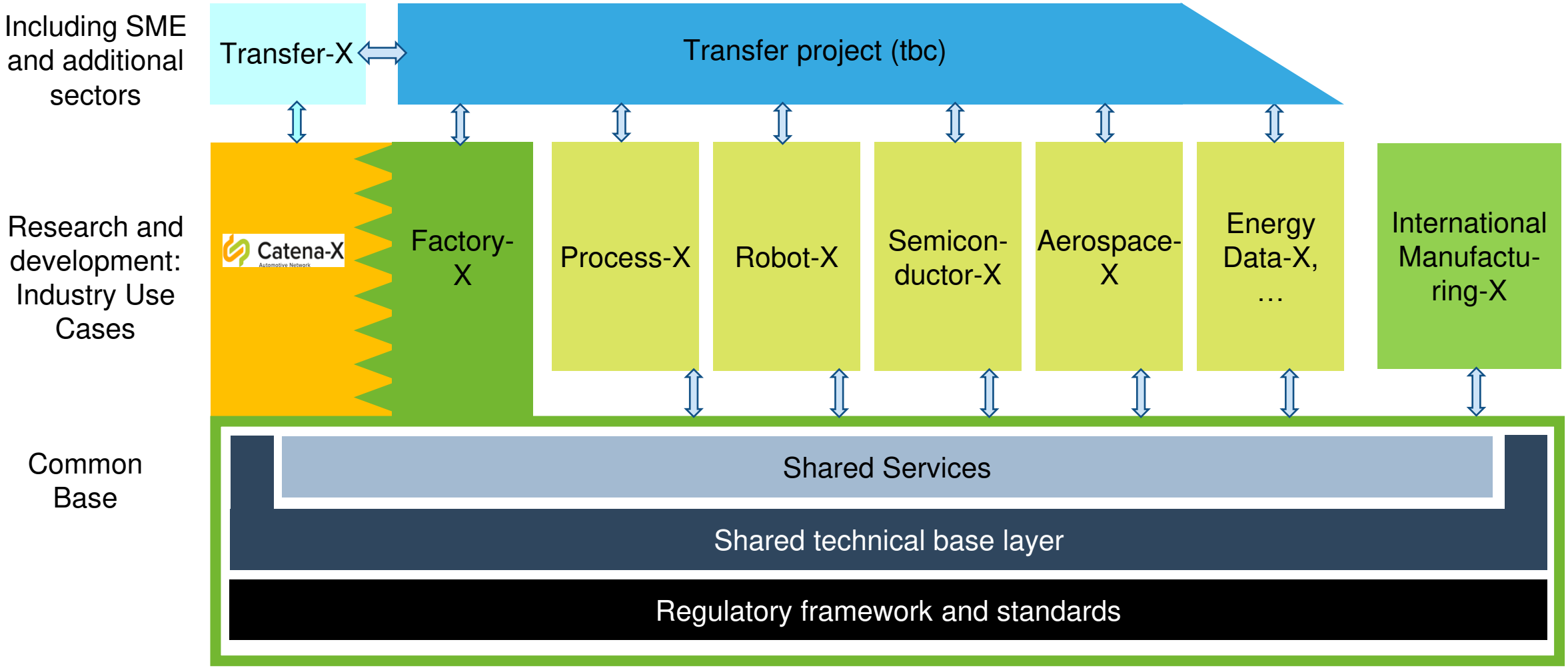
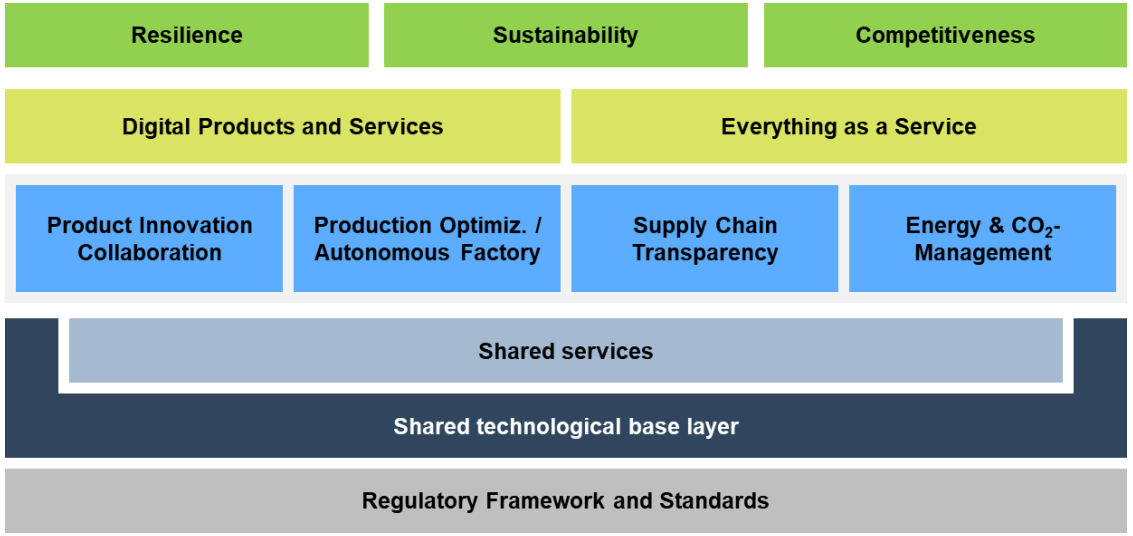
FX Integration Architecture

TP 4 Factory-X Kernel
Systemic approach to „Manufacturing-X“



Shared Services
Standardized Common Base to integrate IT and OT



Problem Statement

- Integration of IT and OT is technical possible but faces several hurdles.
- The standardized application of technology can solve this.

Solution Approach

- Standardized vertical integration (intra-shopfloor) and horizontal integration (eg. IEC, Catena-X)

Goals and Benefit

- Standardized Integration of IT and OT enhances technical capabilities and commercial offerings.
- Using the installed base unchanged protects investments and IP.

Factory-X
FX-Integration Architecture

Basic assumptions

- Industrial Applications are developed and will be developed to fulfill a defined business purpose.
- They define the therefore appropriate interfaces and information structures on their own discretions.
- This enables flexible and fast development of various business cases beyond FX.
- FX needs to support the integration of existing and future Industrial Applications if necessary to implement FX use cases.

FX Integration architecture

- The FX-Integration Architecture defines a finite and well-defined set of architectural building blocks which enable the integration of Industrial Applications without a need to change their interfaces and / or information structures.
- In addition, it supports the discovery of Industrial Applications according to defined criteria as well as their application driven composition according to business purposes.
- Therefore, the FX Integration Architecture provides a set of shared services with standardizes Interfaces.

Use Cases of Factory-X
Basic Assumptions regarding Technical View

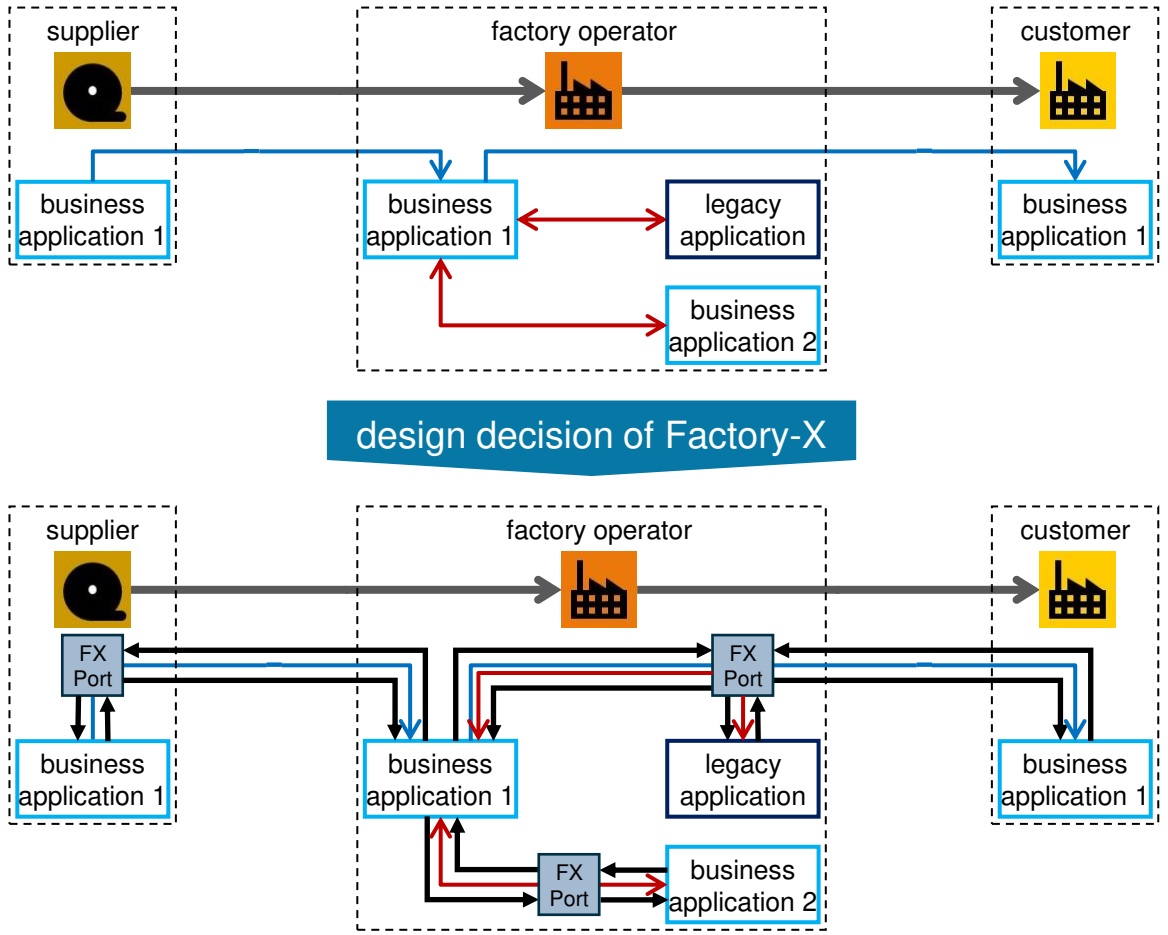
Design decision by Factory-X

- Interactions between business applications will be implemented in a uniform manner using a concept provided by TP4
- Legacy applications will be integrated in a uniform manner using a concept provided by TP4

TP4 will

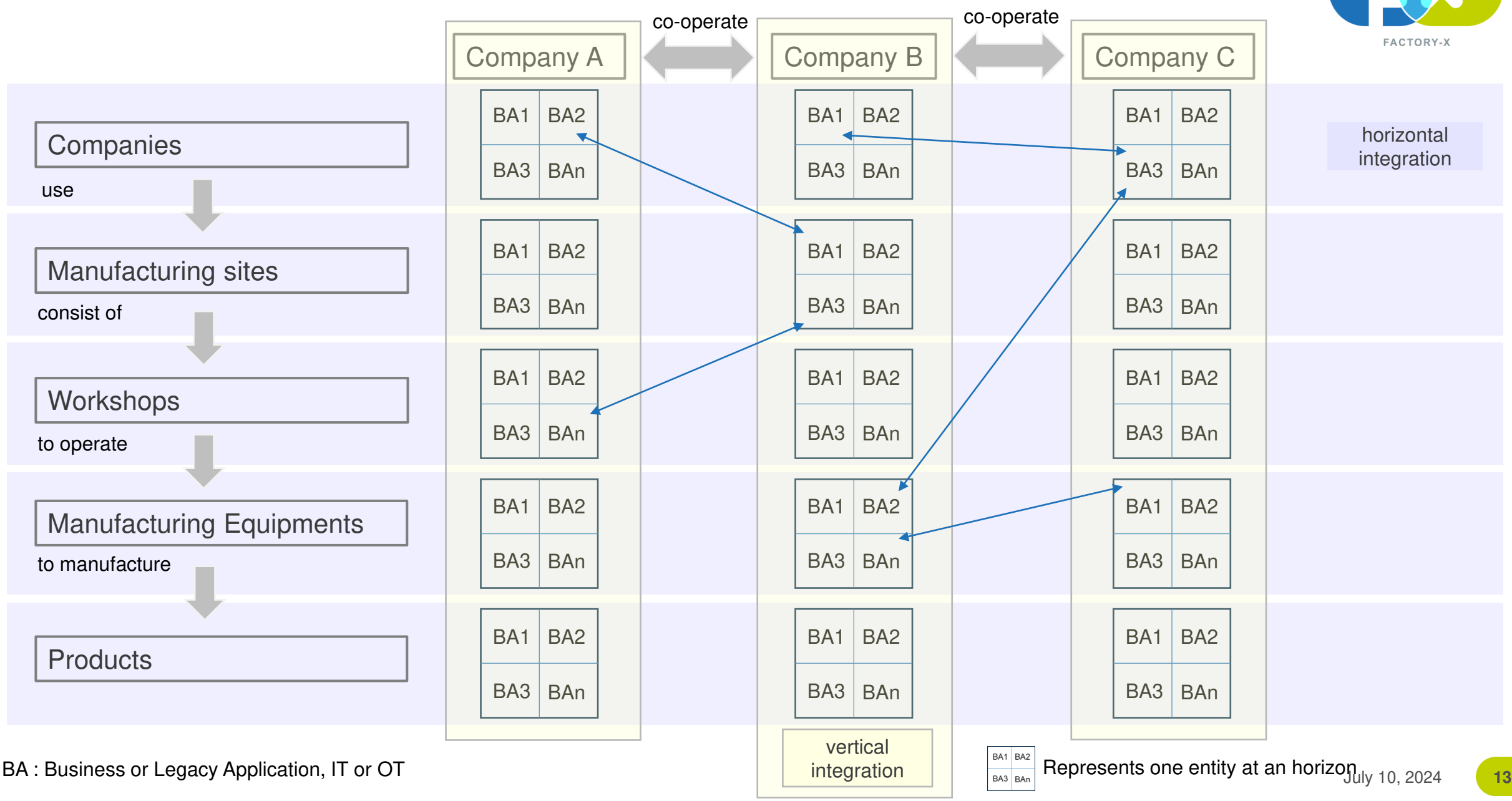
- develop such a FX Port concept
- describe how to apply the FX Port concept
- provide prototypical implementations of the FX Port concept

Illustration



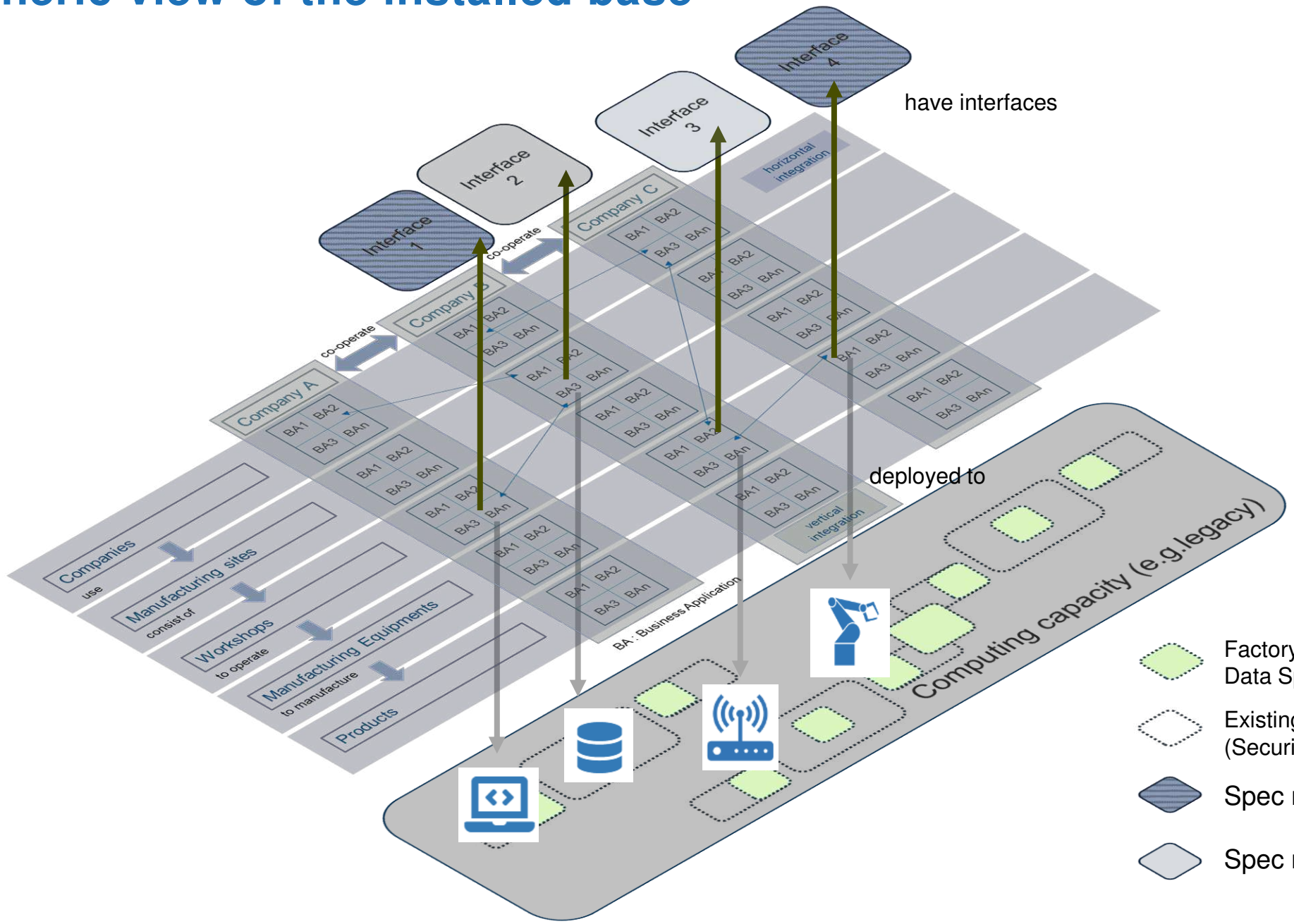
TP4: FX subproject 4, responsible for shared services

FX – generic view to vertical and horizontal integration

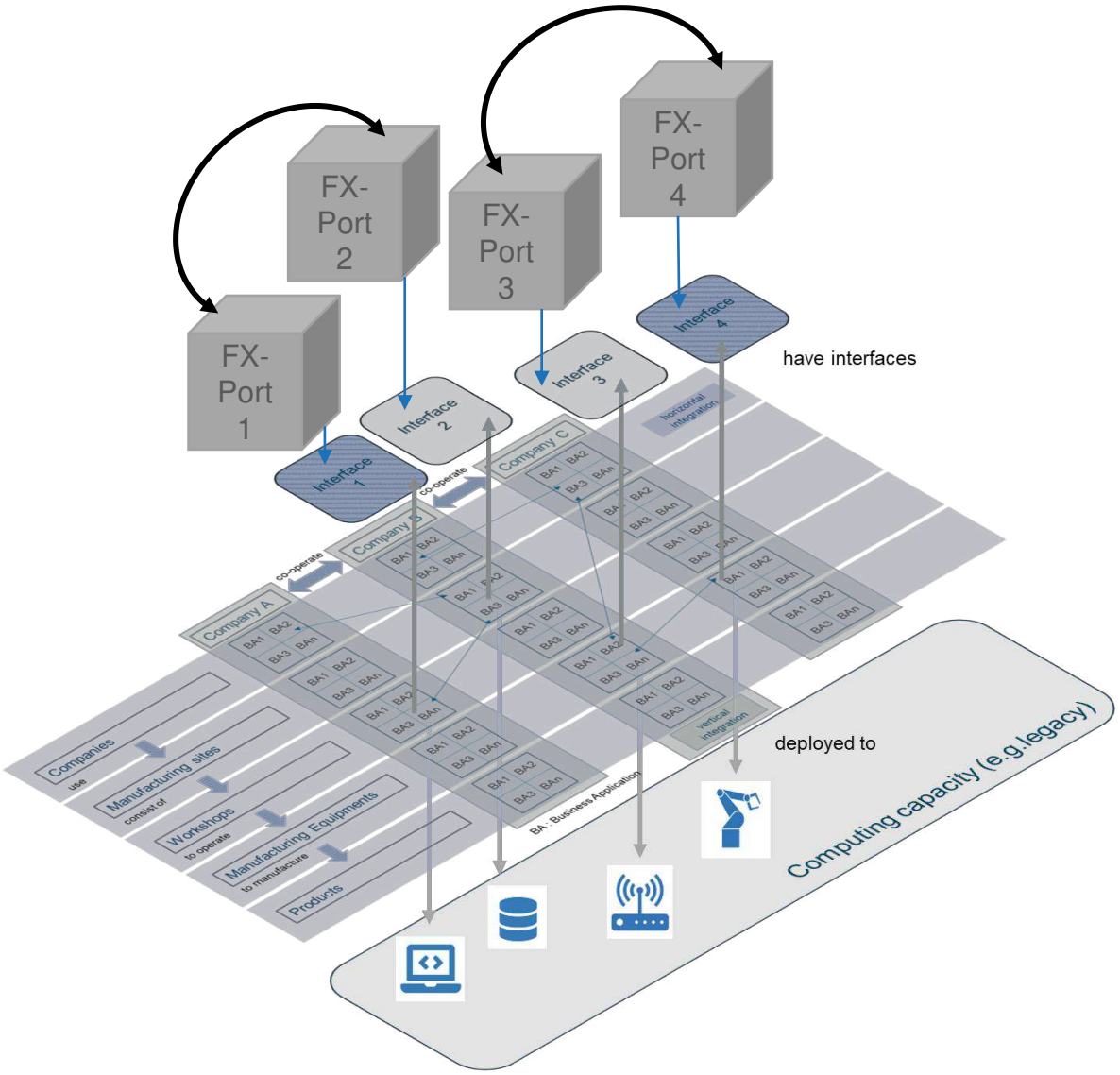


BA : Business or Legacy Application, IT or OT

FX- generic view of the installed base

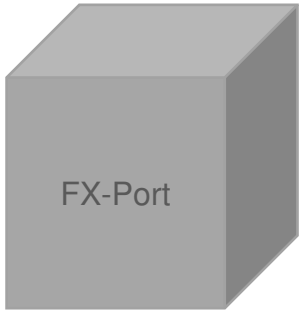


FX-Port generic concept for vertical and horizontal integration



FX-Port is a concept to enable interactions of industrial applications in a uniform way

FX-Port
adapts to BA – interfaces and unifies
- access to information
- representation of information



FX-Port
unifies configuration for
- Access Control and Usage Control of FX-Ports
- Composition and Discovery of FX- Ports,

The FX Integration Architecture will provide a set of shared services with standardized Interfaces of FX-Ports

Data Sovereignity in Factory-X

The value of the Dataspace Protocol

Data Sovereignty (Source DSSC):

The ability of […] organisations to […] exercise their rights on the data, including its collection, storage, sharing, and use by others.

The Dataspace Protocol automates Contract Negotiation and Execution for datasets inspired by Civil Law.

1. **Catalog Retrieval**
   (Provider-to-Consumer, inventatio)
2. **Contract Negotiation**
   (Consumer-to-Provider, offer)
3. **Transfer Process**
   (Provider-to-Consumer, execution)

Providers and Consumers share a common identity and trust infrastructure.

Messages and state transitions are defined on a protocol level and require no specific tooling or implementation. Standardization in ISO will start in late 2024.

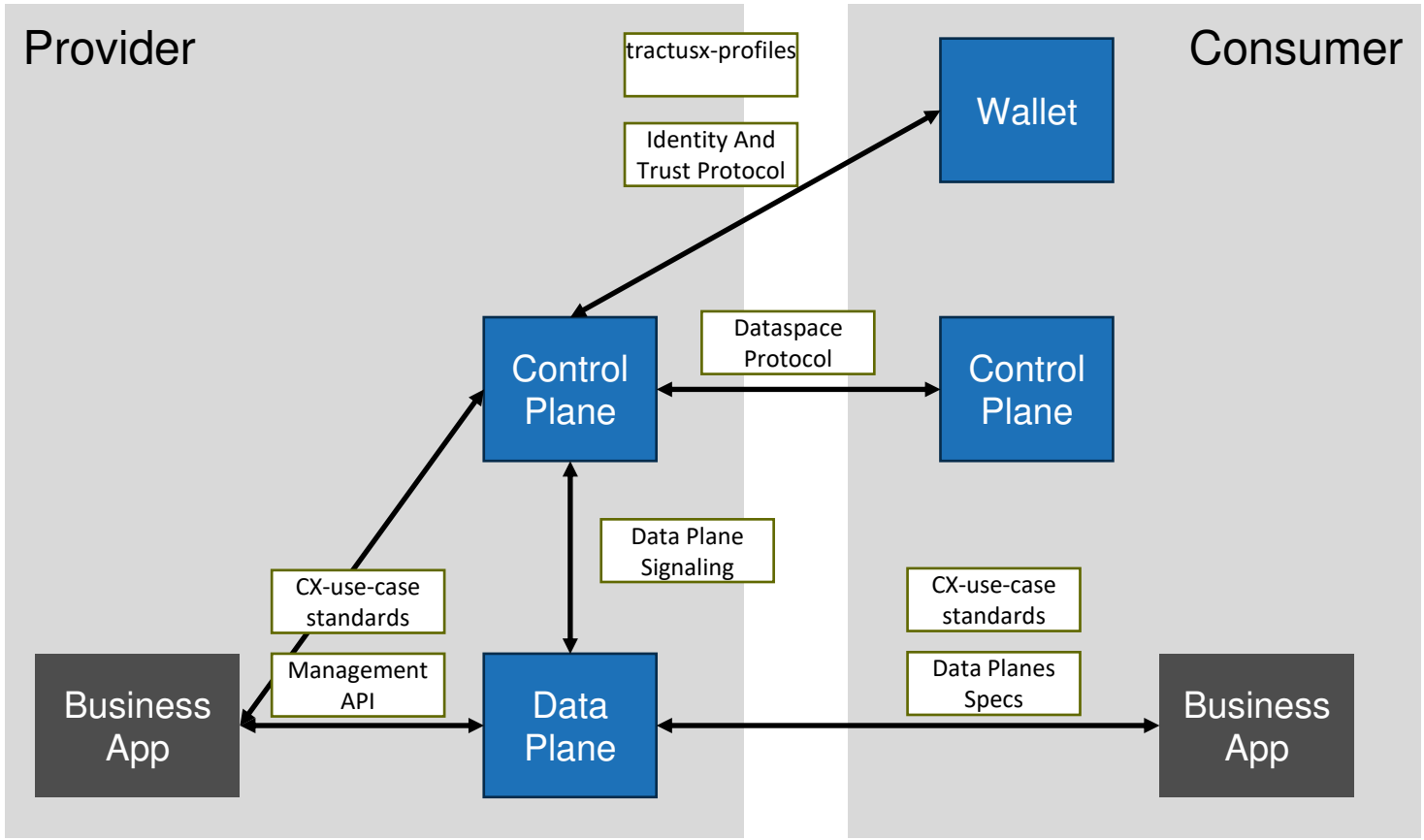
This is in line with the EC's Data Act, especially the requirements from chapter VIII.

There is a production-ready Reference Implementation and Experience with its Roll-Out.

The **Eclipse Dataspace Components** are a modular framework that is

- under active development.
- validated with live use-cases in the automotive industry.
- open for extension and derivative tooling

It provides a stand-alone and industry-agnostic service for authentication in the Dataspace.



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FX Integration Architecture

Outlook

FX Integration Architecture Outlook

- Close collaboration with FX-Use Cases to refine requirements for the FX-Port concept.
- Further detailing the FX-Port concept from functional viewpoint according to requirements e.g. components of an FX-Port and belonging services.
- Develop a harmonized and easy to understand guidance on how to use the FX-Port in a given scenario of a particular use case.
- Decide on first architectural guardrails for design and implementation.
- Develop a concept how to re-use and combine results of Catena-X (e.g. Dataspace Protocol) and Platform Industrie4.0 (e.g. Asset Administration Shell)
- Identify missing elements and decide how to develop and add them.
- Showcase first implementations (even partially) of use cases to verify and if necessary, adjust the FX-Port concept.

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Q & A

Thank you

Contact information:

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www.factory-x.org

Backup

Factory-X
Project Organization

- TP 1: Project Management
- TP 2: Use-Cases
- TP 3: Business Models
- TP 4: Factory-X Kernel & Basis Services
- TP 5: Factory-X Operating Model
- TP 6: Transfer measures
- TP 7: Manufacturing-X wide coordination