4th AutomationML User Conference

Creating a Smart Factory Web based upon AutomationML

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Smart Factory Web: Overview

Goals

- Flexible adaptation of production capabilities and sharing of resources/assets in a web of Smart Factories to improve order fulfillment
- Provide the technical basis for new business models with flexible assignment of production resources across factory locations
- Factory-to-factory interoperability with the industrial standards OPC UA and AutomationML
- Enable cross-site usage scenarios with secure Plug & Work functions and data analytics

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Smart Factory Web

www.smartfactoryweb.com

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Smart Factory Web as an IIC Testbed

- Smart Factory Web is an approved testbed of the Industrial Internet Consortium (IIC) since 19.09.2016
- IIC Testbeds are a “controlled experimentation program where testbed applications are deployed and tested in an environment that resembles real-world conditions”.
- Purpose of IIC Testbeds:
  - Develop and demonstrate solutions that grow and create markets around the IIoT
  - Advance and validate the IIC *Industrial Internet Reference Architecture* IIRA and the *Security Framework*
  - Attract investment, public or private, that enables organizations to work together
- Approval process is a multi-step expert peer and management review

Usage Scenario and View: Order driven, flexible adaption of production value chains

I need more production lines since my factory is running at full capacity with customer orders

Factory A

Factory B

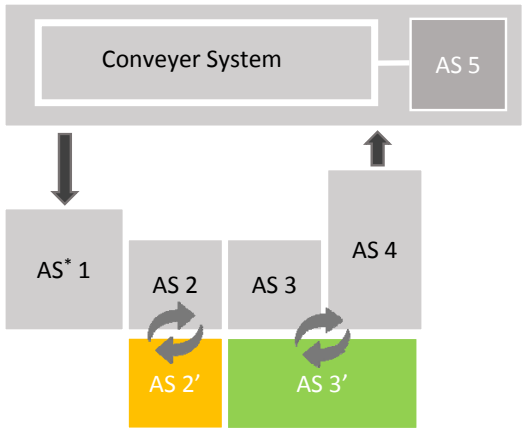
Smart Factory Web Portal

Factory A

- Check the status of other factories
- Find an available Factory B
- Place an order with specific requirements via the SFW portal

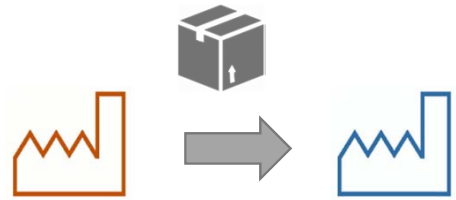
Factory B Production line

* AS: Assets (e.g. robots, machines ….)



Factory B

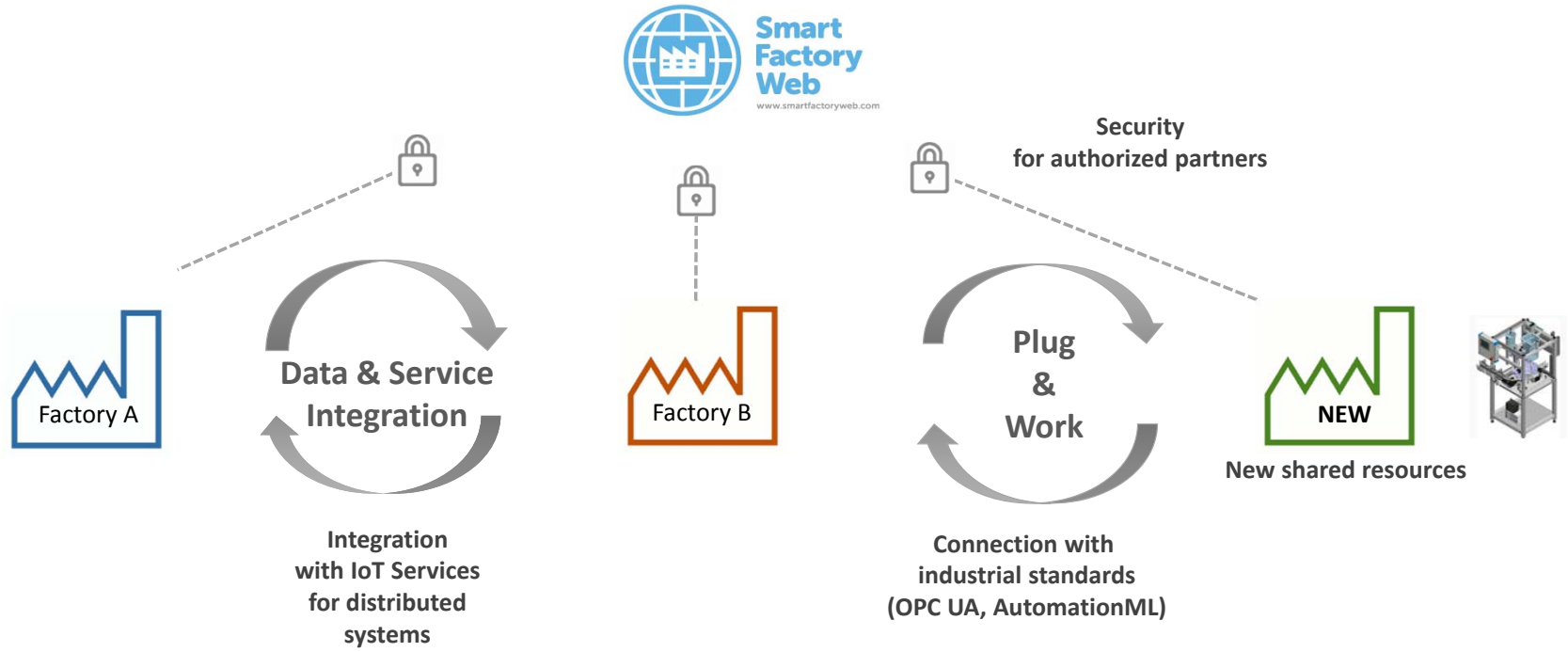
- Check its production status
- If OK, adapt production assets of Factory B by secure Plug & Work techniques
  (replace AS 2 and 3&4 with AS 2' and AS 3')
- Factory B starts to produce products



Factory B

- Send product to Factory A or customers

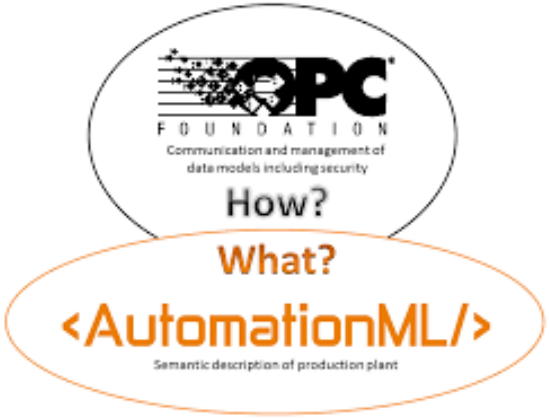
Solution Overview



Standards applied in Solution

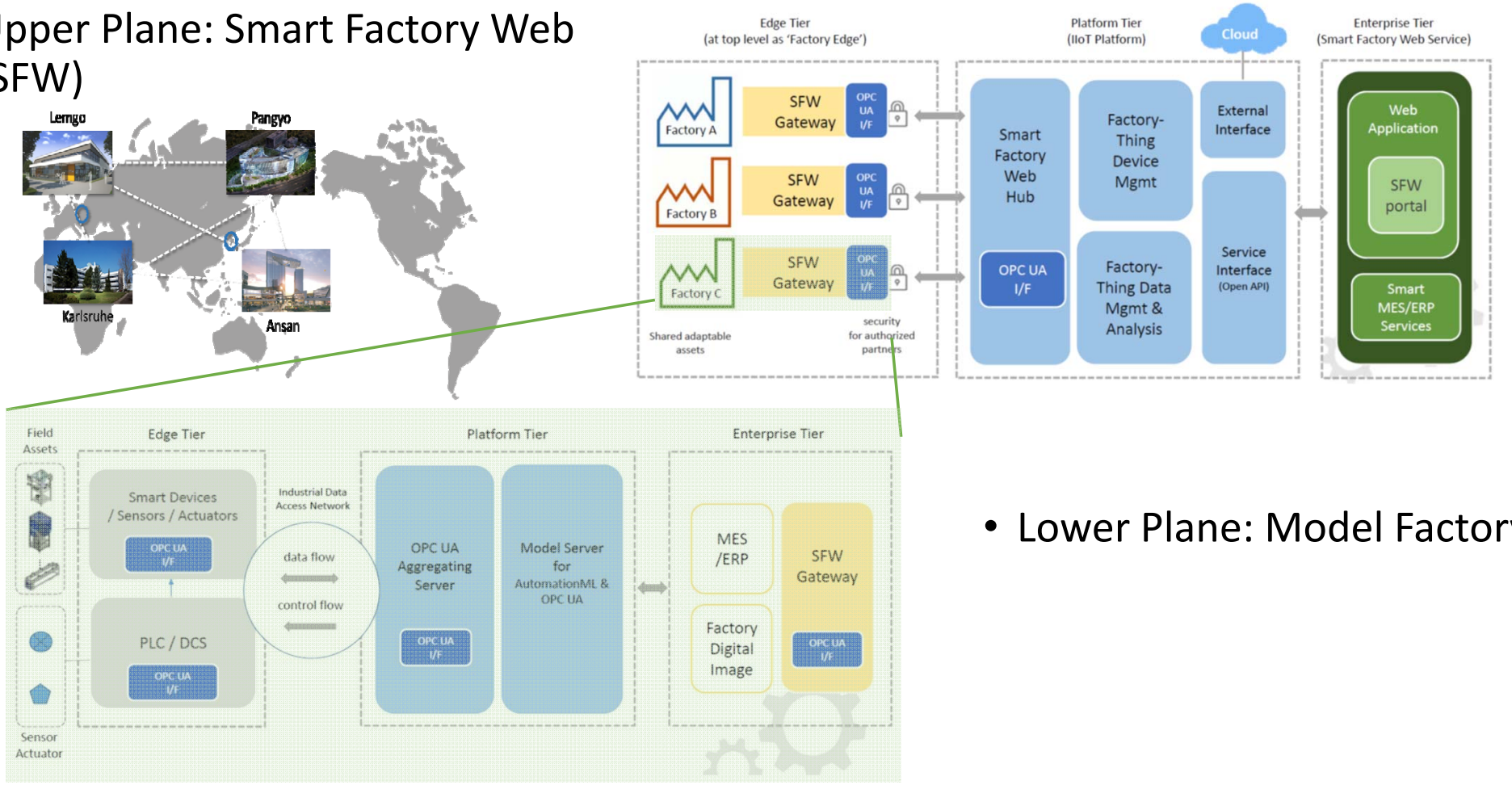
Plug&Work will use industrial standards

- OPC-UA (IEC 62541)
  - Communication standard for the interoperability of multi-vendor, multi-platform data exchange
- AutomationML (IEC 62714)
  - Data format based on XML for the storage and exchange of plant engineering information
- Companion Specification “OPC Unified Architecture for AutomationML”
- DIN SPEC 16592 – Combining AutomationML and OPC Unified Architecture, to be published in 2016



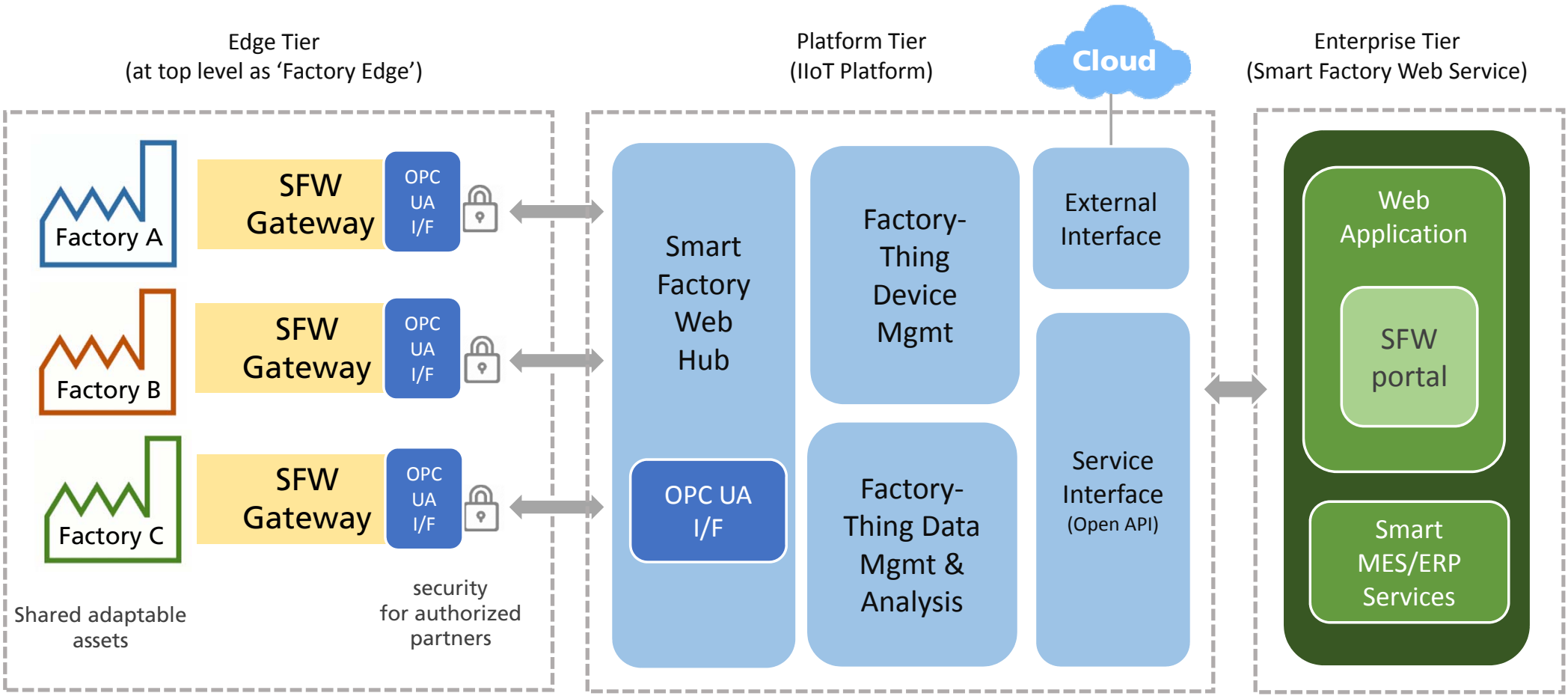
Implementation View: Testbed Architecture Planes

- Upper Plane: Smart Factory Web (SFW)

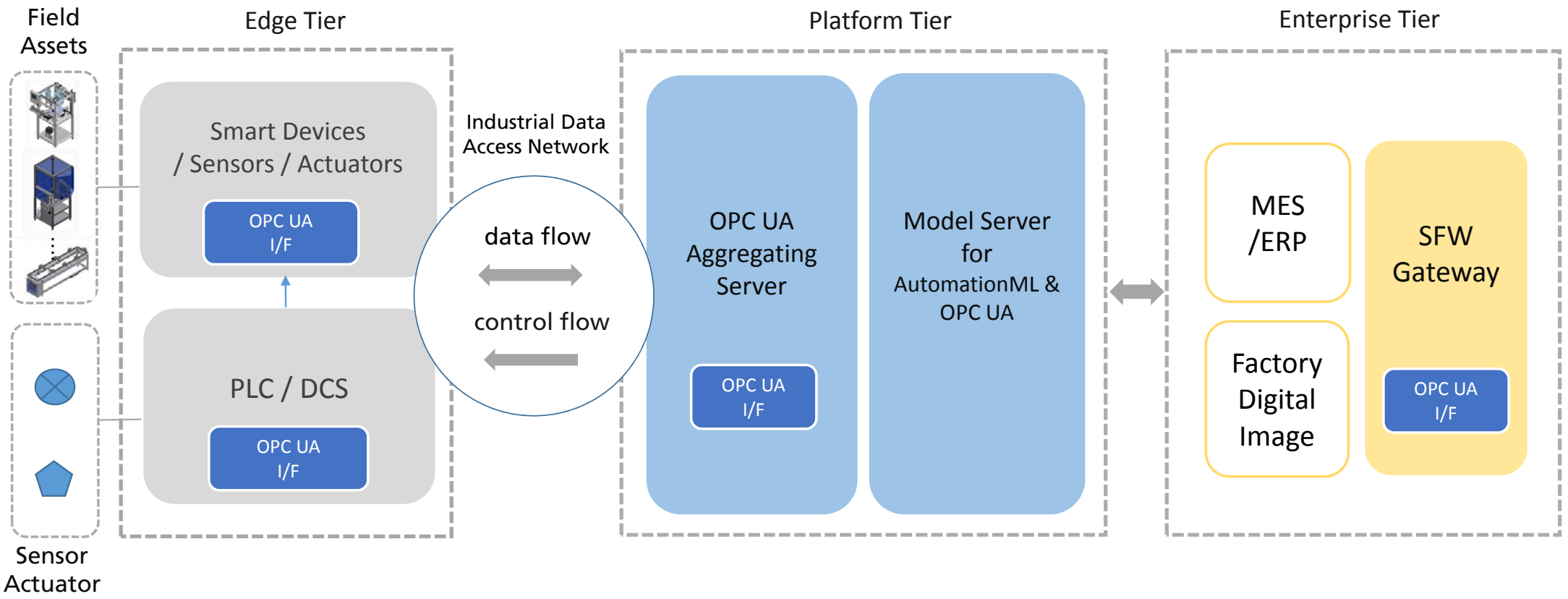


- Lower Plane: Model Factory

Testbed Architecture upper plane: SFW

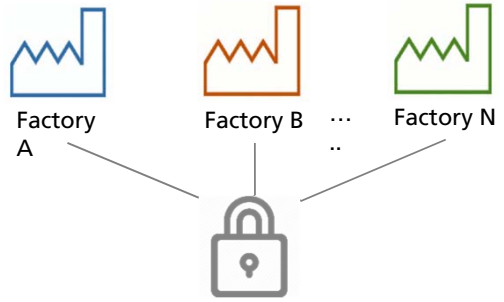


Testbed Architecture lower plane: Model Factory



Phased Approach Overview

Phase 1: Geospatial Mapping and Factory Information

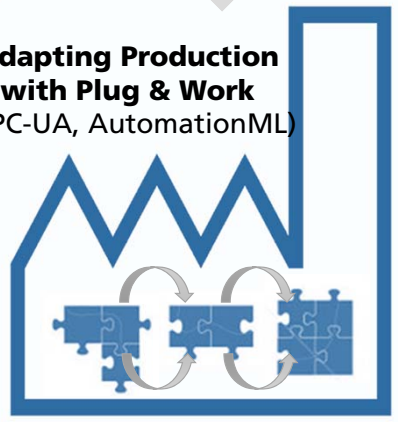


Sub-Scenario 1.1 & 1.2: Registering and Discovering Smart Factories

Phase 2: Plug & Work

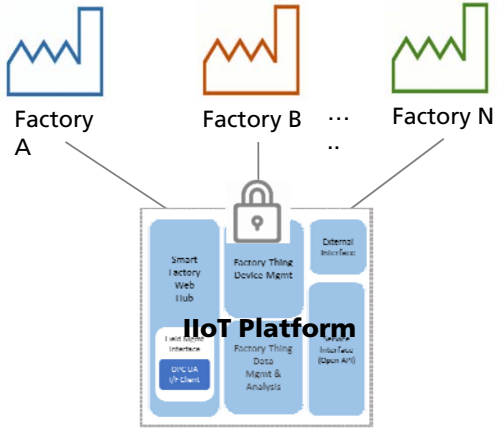
Order Request

Adapting Production with Plug & Work
(OPC-UA, AutomationML)



Sub-Scenario 1.4: Adapting Factory Production

Phase 3: Data & Service Integration



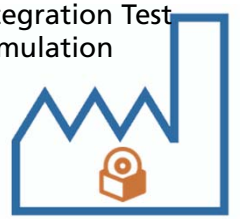
Secure Asset Connectivity

Asset Status Monitoring

Sub-Scenario 1.5: SFW Asset Connectivity and Monitoring

Phase 4: Collaboration

Pre-Integration Test Simulation



Factory A

Sharing software assets
"Software Plug & Work"

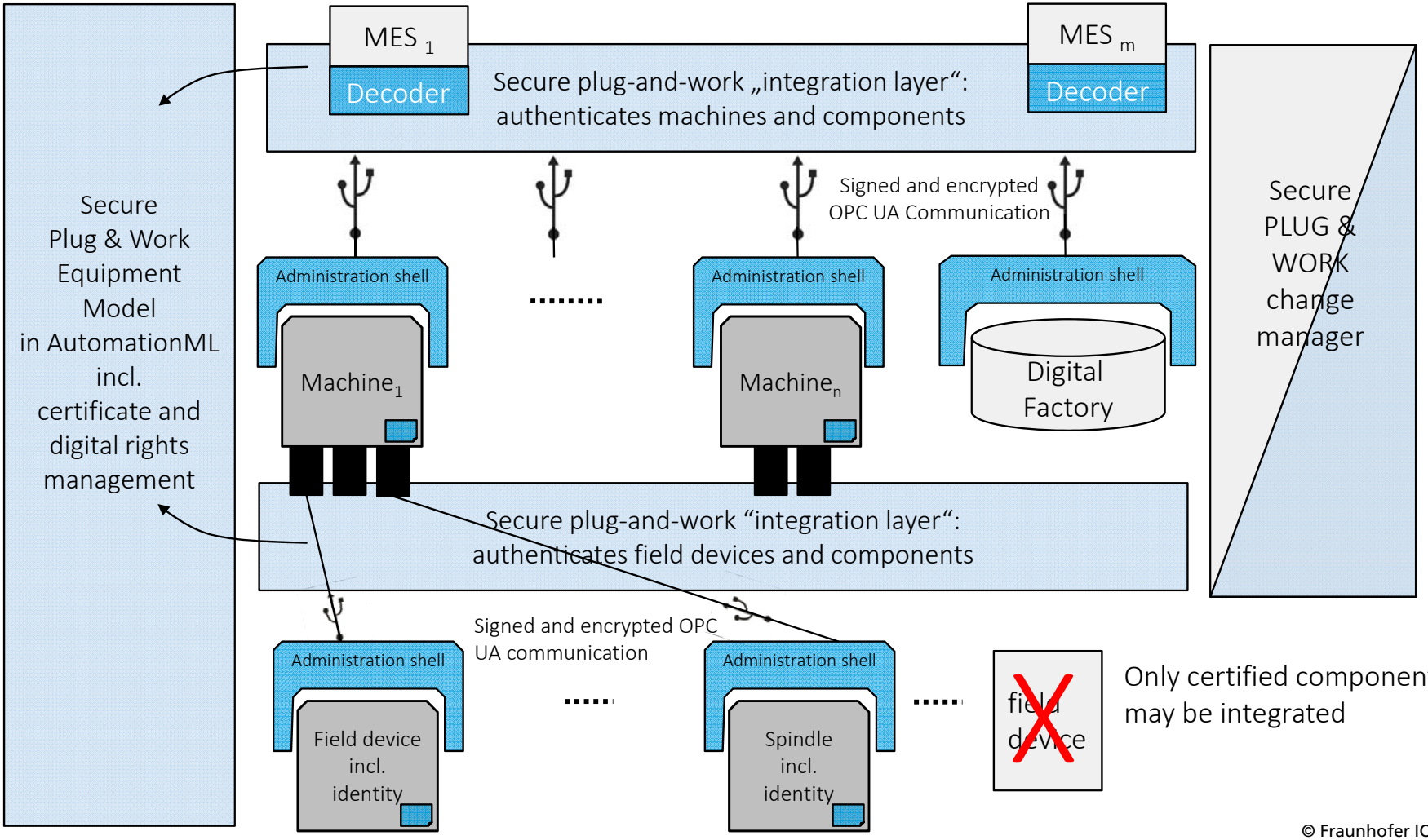
Factory B

Sub-scenario 1.6: Collaborative Engineering

Highlights of testing

Phase	Test Highlight
Phase 1: Geospatial Mapping and Factory Information	Description of factory capabilities, using AutomationML for asset models and ontological approach for capabilities
Phase 2: Plug & Work	Application of Plug & Work in IIRA, Usage of OPC UA and AutomationML
Phase 3: Data & Service Integration	Secure data aggregation service across factories; Defining access rights in AutomationML; Usage of OPC UA security profiles
Phase 4: Collaboration	Architectures and design patterns for software Plug & Work

Secure PLUG&WORK Architecture in Industrie 4.0



Manifest of Administration Shell in AutomationML

= Software component

= Certificate, e.g. WIBU-SYSTEMS CodeMeter™ as trust anchor

Challenges and on-going work for AutomationML

- Supporting description and visualization of factory assets and capabilities at different levels of detail with specific access rights to information
  - Link to general relational models for production and resources
  - Link to ontologies for asset and production capability descriptions
  - Semantic search
- Integration of security information on different levels
- Integration of geospatial data (OGC standards)
- Usage of transformation rules AutomationML to OPC UA
- Usage DataVariable concept

Testbed participation

Lead Participants

- **KETI**: Model factories in Pangyo and Ansan, knowledge and tools for IIoT infrastructure
- **Fraunhofer IOSB:** Model factories in Karlsruhe and Lemgo, knowledge and tools for industrial automation, OPC UA, AutomationML, and security

Participation Opportunities

- IIC member companies are welcome to participate, particularly through the
  - Co-funding testbed activities
  - Deployment of the architecture or technologies in their real-world applications
- External factories can be included in the Smart Factory Web (SFW) and optionally made accessible via the SFW portal
  - Registration of Smart Factories on SFW portal www.smartfactoryweb.com with factory models in AutomationML and OPC UA interface

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Thank you for your attention!

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