11 Use Cases of Factory-X

11 Use Cases for horizontal and vertical data transfer

Int. Toolchains & Collab. Eng.

Inf. Update and Change Service

Collaborative Information Logistics

Condition Monitoring led Services

Modular Production

Manufacturing aaS

Autonomous Operation aaS

Traceability

Energy-Consump. & Load Management
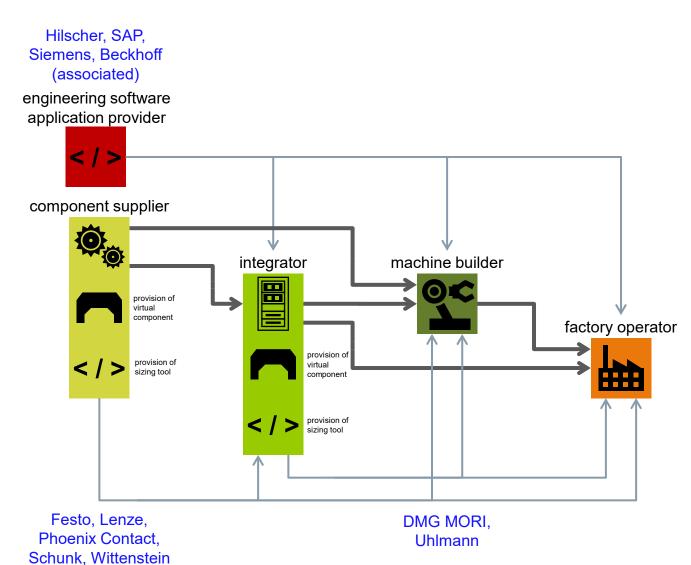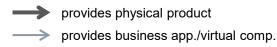
Carbon Footprint Mgmnt.

Circular Economy

Use Case 2.1
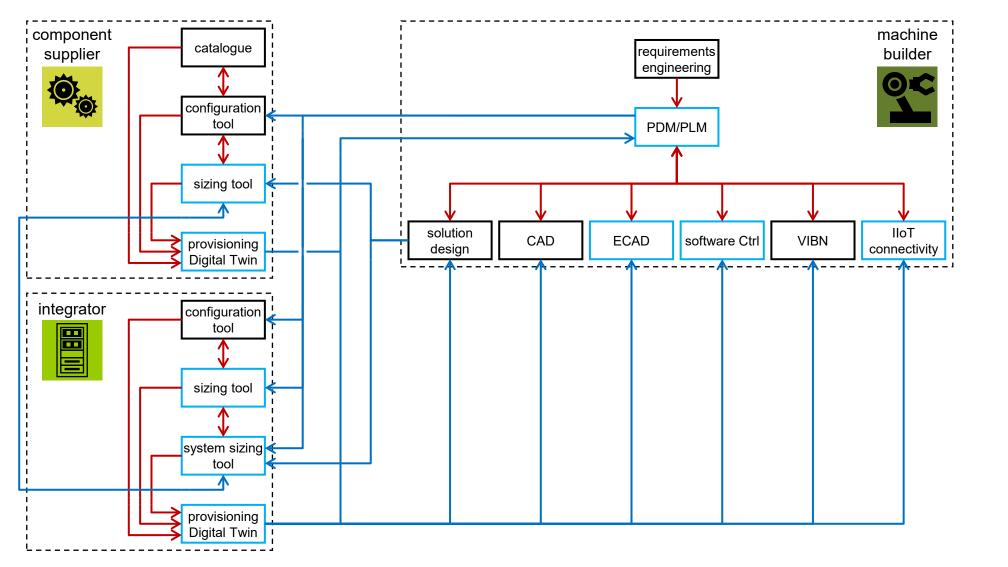# Integrated Toolchains and Collaborative Engineering

UC 2.1 Integrated Toolchains and Collaborative Engineering
WS 1 Business View

Hilscher, SAP, Siemens, Beckhoff (associated)

engineering software application provider

provides physical product

provides business app./virtual comp.

component supplier

integrator

machine builder

factory operator

provision of virtual component

provision of sizing tool

provision of virtual component

provision of sizing tool

Festo, Lenze, Phoenix Contact, Schunk, Wittenstein

DMG MORI, Uhlmann

UC 2.1 Integrated Toolchains and Collaborative Engineering WS 1 Usage View

FACTORY-X

component supplier

- catalogue
- configuration tool
- sizing tool
- provisioning Digital Twin

integrator

- configuration tool
- sizing tool
- system sizing tool
- provisioning Digital Twin

machine builder

- requirements engineering
- PDM/PLM
- solution design
- CAD
- ECAD
- software Ctrl
- VIBN
- IIoT connectivity

Legend:
- ⟷ internal data flow
- ⟷ data flow across company borders
- app business application
- app legacy application

⟷ 17
⟵-⟶ 0
⟷ 14
⟵-⟶ 0

UC 2.1 Integrated Toolchains and Collaborative Engineering WS 1 abstract Business View
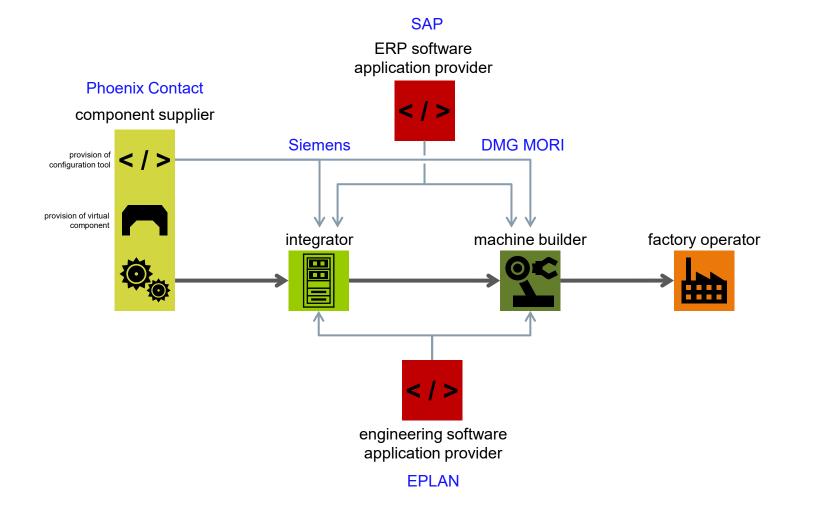
factory operator

machine builder

component supplier

integrator

component supplier
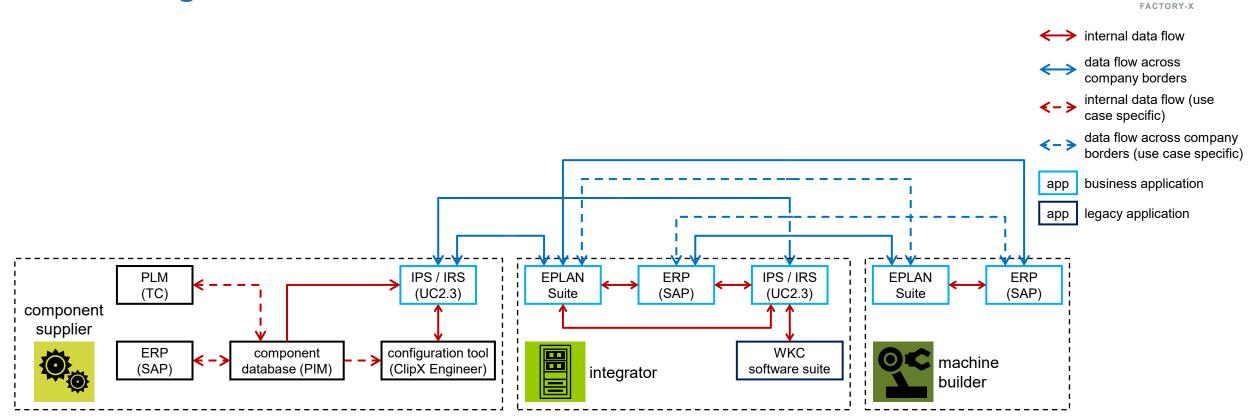
UC 2.1 Integrated Toolchains and Collaborative Engineering WS 2 Business View

provides physical product

provides business app./virtual comp.

SAP

ERP software
application provider

Phoenix Contact

component supplier

Siemens

DMG MORI

provision of configuration tool

provision of virtual component

integrator

machine builder

factory operator

engineering software
application provider

EPLAN

UC 2.1 Integrated Toolchains and Collaborative Engineering WS 2 Usage View

Legend:
- ⟷ internal data flow
- ⟷ data flow across company borders
- ⟵ - ⟶ internal data flow (use case specific)
- ⟵ - ⟶ data flow across company borders (use case specific)
- app business application
- app legacy application

component supplier:
- PLM (TC)
- ERP (SAP)
- component database (PIM)
- configuration tool (ClipX Engineer)
- IPS / IRS (UC2.3)

integrator:
- EPLAN Suite
- ERP (SAP)
- IPS / IRS (UC2.3)
- WKC software suite

machine builder:
- EPLAN Suite
- ERP (SAP)

Counts:
- ⟷ 7
- ⟵ - ⟶ 3
- ⟷ 4
- ⟵ - ⟶ 2

UC 2.1 Integrated Toolchains and Collaborative Engineering WS 2 abstract Business View

factory operator

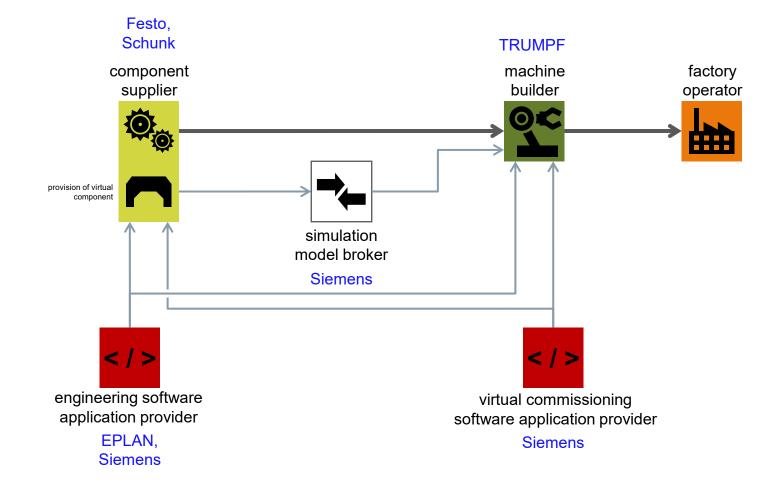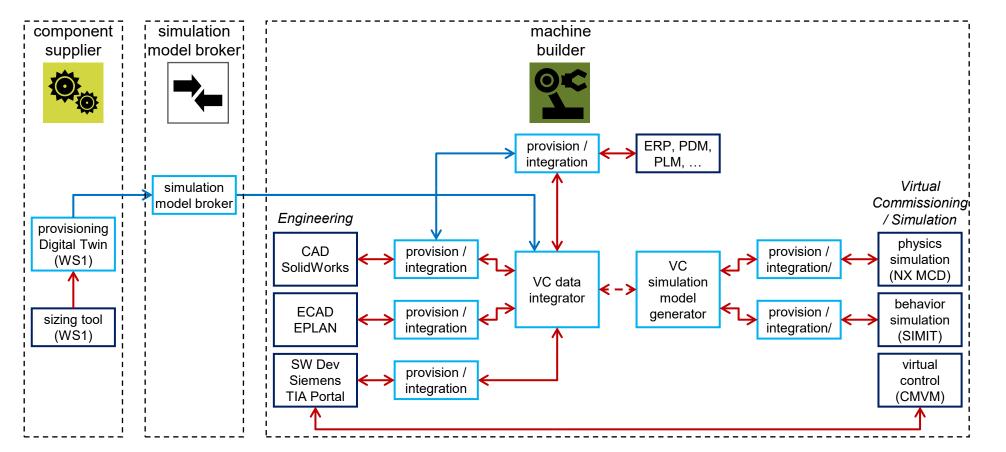machine builder

integrator

component supplier

UC 2.1 Integrated Toolchains and Collaborative Engineering WS 3 Business View

provides physical product

provides business app./virtual comp.

Festo, Schunk

component supplier

TRUMPF

machine builder

factory operator

provision of virtual component

simulation model broker

Siemens

engineering software application provider

EPLAN, Siemens

virtual commissioning software application provider

Siemens

UC 2.1 Integrated Toolchains and Collaborative Engineering WS 3 Usage View

component supplier

provisioning Digital Twin (WS1)

sizing tool (WS1)

simulation model broker

simulation model broker

machine builder

provision / integration — ERP, PDM, PLM, …

Engineering

CAD SolidWorks — provision / integration

ECAD EPLAN — provision / integration

SW Dev Siemens TIA Portal — provision / integration

VC data integrator

VC simulation model generator

provision / integration/

provision / integration/

Virtual Commissioning / Simulation

physics simulation (NX MCD)

behavior simulation (SIMIT)

virtual control (CMVM)

Legend:
- ⟷ internal data flow
- ⟷ data flow across company borders
- ⟷ internal data flow (use case specific)
- app business application
- app legacy application

⟷ 14
⟷ 1
⟷ 4
⟷ 0

14 May 2025   11

UC 2.1 Integrated Toolchains and Collaborative Engineering WS 3 abstract Business View
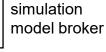
factory operator

machine builder

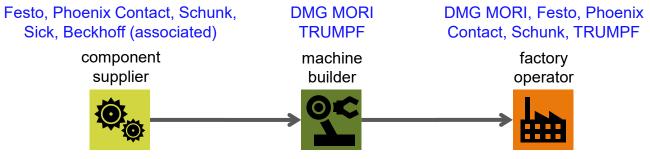simulation model broker

component supplier

Use Case 2.2
Information Update and Change Service
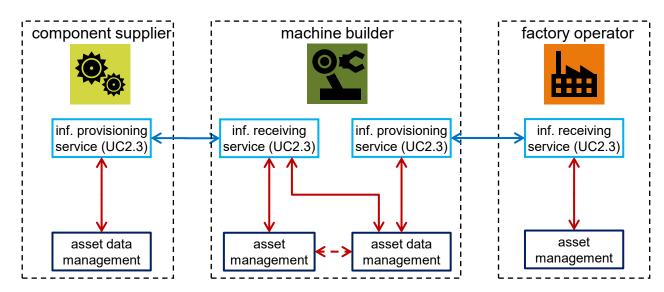
UC 2.2 Information Update and Change Service
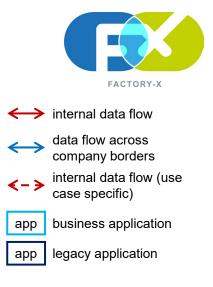# WS 1 (Horizontal Data Infrastructure) Business View

Festo, Phoenix Contact, Schunk,
Sick, Beckhoff (associated)

component
supplier

DMG MORI
TRUMPF

machine
builder

DMG MORI, Festo, Phoenix
Contact, Schunk, TRUMPF

factory
operator

provides physical product

UC 2.2 Information Update and Change Service
WS 1 (Horizontal Data Infrastructure) Usage View

UC 2.2 Information Update and Change Service
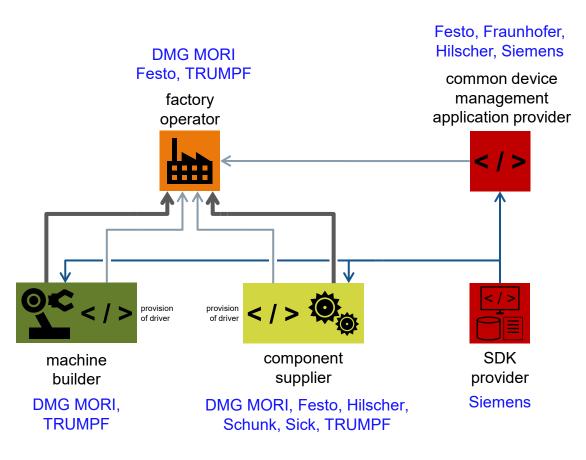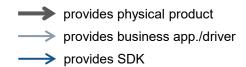# WS 1 (Horizontal Data Infrastructure) abstract Business View

factory operator

machine builder

component supplier

UC 2.2 Information Update and Change Service
WS 2 (Vertical Data Infrastructure) Business View

provides physical product
provides business app./driver
provides SDK

DMG MORI
Festo, TRUMPF

factory operator

Festo, Fraunhofer, Hilscher, Siemens

common device management application provider

machine builder

DMG MORI, TRUMPF

component supplier

DMG MORI, Festo, Hilscher, Schunk, Sick, TRUMPF

SDK provider

Siemens

provision of driver

provision of driver
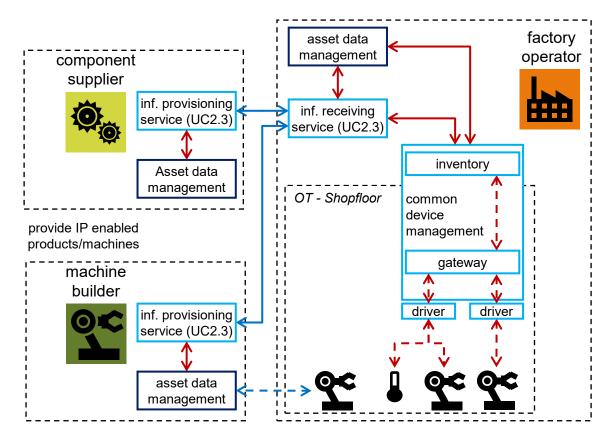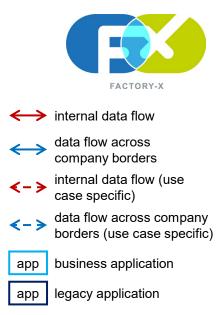
UC 2.2 Information Update and Change Service WS 2 (Vertical Data Infrastructure) Usage View

UC 2.2 Information Update and Change Service
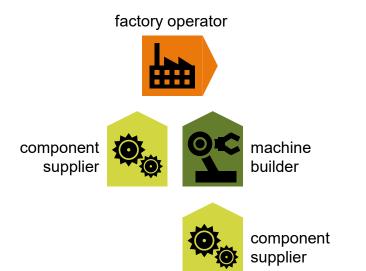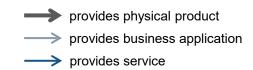# WS 2 (Vertical Data Infrastructure) abstract Business View

factory operator

component
supplier

machine
builder

component
supplier
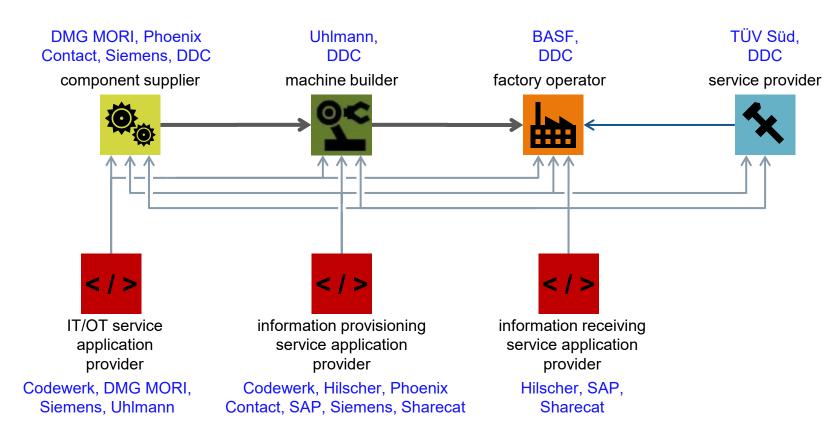
Use Case 2.3
Collaborative Information Logistics
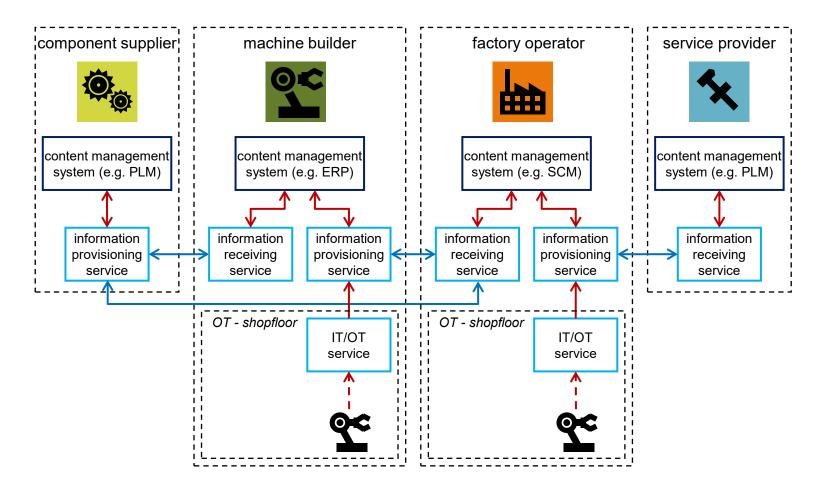
UC 2.3 Collaborative Information Logistics Business View

provides physical product
provides business application
provides service

DMG MORI, Phoenix Contact, Siemens, DDC

component supplier

Uhlmann, DDC

machine builder

BASF, DDC

factory operator

TÜV Süd, DDC

service provider

IT/OT service application provider

Codewerk, DMG MORI, Siemens, Uhlmann

information provisioning service application provider

Codewerk, Hilscher, Phoenix Contact, SAP, Siemens, Sharecat

information receiving service application provider

Hilscher, SAP, Sharecat

UC 2.3 Collaborative Information Logistics
Usage View
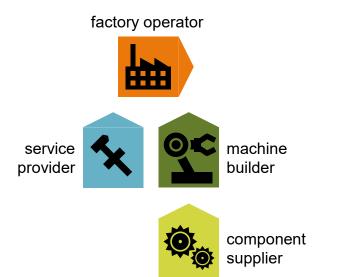
UC 2.3 Collaborative Information Logistics abstract Business View

factory operator

service provider

machine builder

component supplier
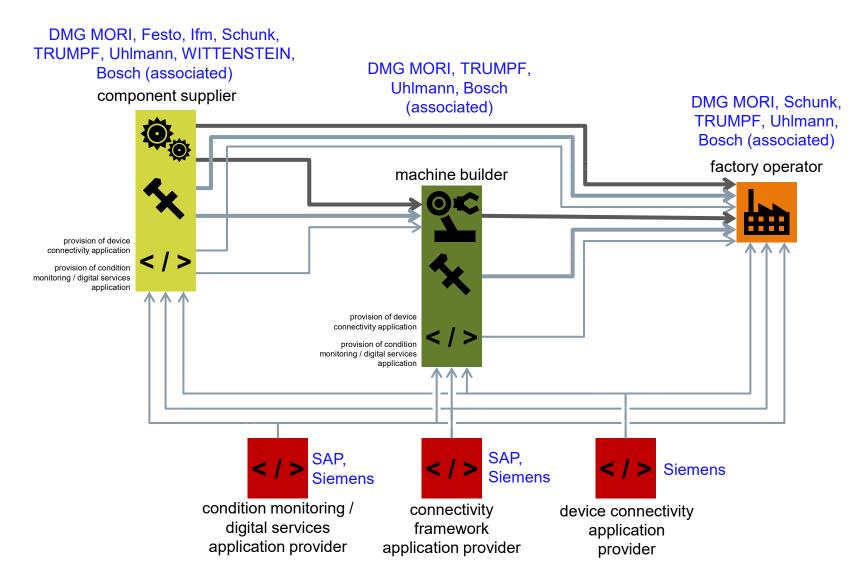
Use Case 2.4
Condition Monitoring led Services
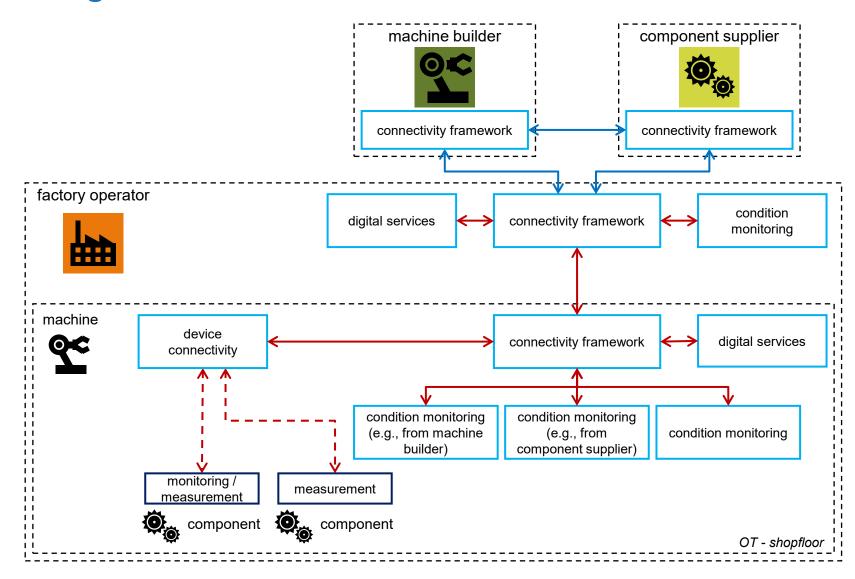
UC 2.4 Condition Monitoring led Services Business View

DMG MORI, Festo, Ifm, Schunk, TRUMPF, Uhlmann, WITTENSTEIN, Bosch (associated)

component supplier

DMG MORI, TRUMPF, Uhlmann, Bosch (associated)

machine builder

DMG MORI, Schunk, TRUMPF, Uhlmann, Bosch (associated)

factory operator
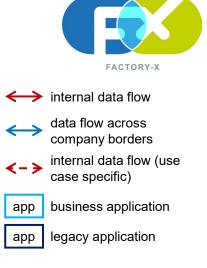
provides physical product
provides physical service
provides business application

provision of device connectivity application
provision of condition monitoring / digital services application

provision of device connectivity application
provision of condition monitoring / digital services application

SAP, Siemens
condition monitoring / digital services application provider

SAP, Siemens
connectivity framework application provider

Siemens
device connectivity application provider

UC 2.4 Condition Monitoring led Services
Usage View

UC 2.4 Condition Monitoring led Services abstract Business View

factory operator

machine builder

component supplier
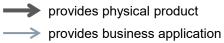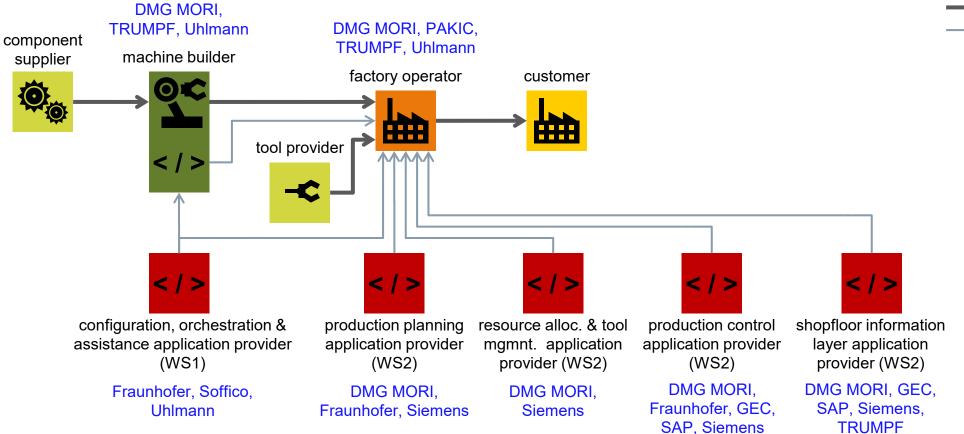
Use Case 2.5
Modular Production

UC 2.5 Modular Production Business View

component supplier

DMG MORI, TRUMPF, Uhlmann
machine builder

DMG MORI, PAKIC, TRUMPF, Uhlmann
factory operator

customer

tool provider

provides physical product
provides business application

configuration, orchestration & assistance application provider (WS1)

Fraunhofer, Soffico, Uhlmann

production planning application provider (WS2)

DMG MORI, Fraunhofer, Siemens

resource alloc. & tool mgmnt. application provider (WS2)

DMG MORI, Siemens

production control application provider (WS2)

DMG MORI, Fraunhofer, GEC, SAP, Siemens

shopfloor information layer application provider (WS2)

DMG MORI, GEC, SAP, Siemens, TRUMPF

UC 2.5 Modular Production
WS 1 Usage View

factory operator

production machines

machine 1   machine n

MES

configuration, orchestration & assistance: skill base module orchestration and runtime system

configuration, orchestration & assistance: plug & play module configurator

configuration, orchestration & assistance: adaptive virtual commissioning assistant, changeover assistant

manufacturing equipment database

shopfloor information layer (WS2)

OT - shopfloor

ERP

IT systems (QM/ERP/...) resp. validation system

⟷	internal data flow
⟵-->	internal data flow (use case specific)
app	business application
app	legacy application

⟷	6
⟵-->	3
⟷	0
⟵-->	0

UC 2.5 Modular Production
WS 2 Usage View

on-demand manuf. service provider
- e.g. match making, automized order management (UC2.6)

factory operator

customer
- e.g. procurement

tool provider
- e.g. ERP

machine builder
- e.g. ERP

ERP

production planning: process and data flow transformer

resource allocation & tool management

MES/PPS

production planning: dynamic order synchronization

production control: adaptive production control / runtime system

shopfloor information layer

production control: adaptive production supply

F-X Positioning Hub

located objects

machine 1   machine n
production machines

OT - shopfloor

Legend
- internal data flow
- data flow across company borders
- internal data flow (use case specific)
- app   business application
- app   legacy application

- 9   internal data flow
- 2   internal data flow (use case specific)
- 5   data flow across company borders
- 0

UC 2.5 Modular Production abstract Business View

factory operator

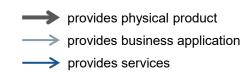customer

tool provider

machine builder

component supplier

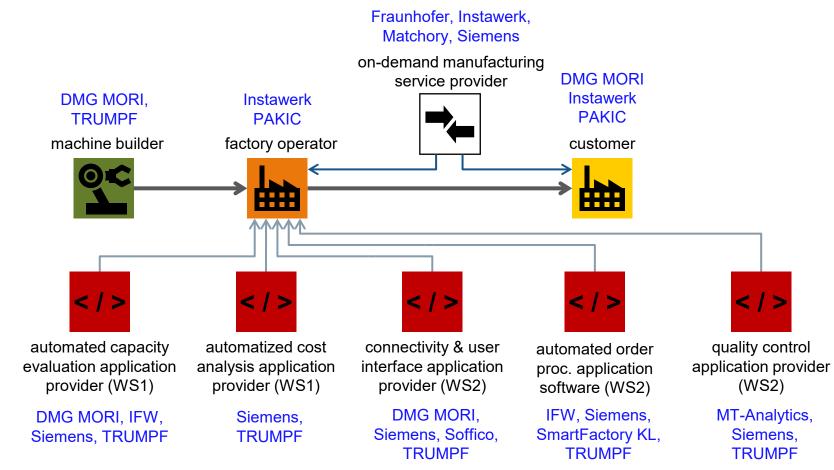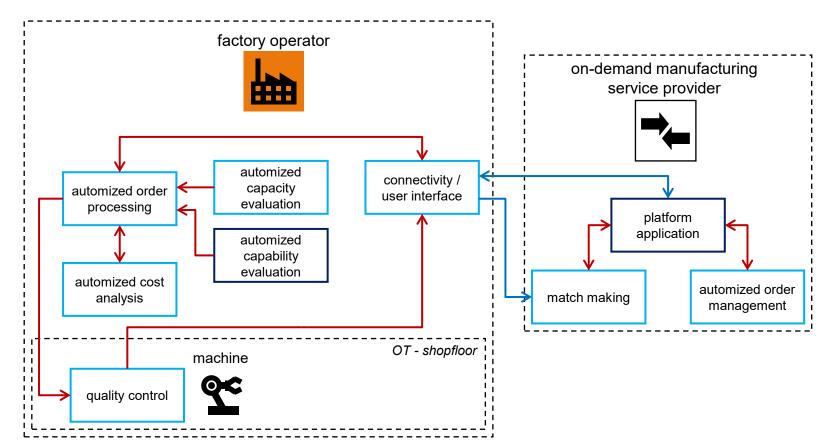# Use Case 2.6 Manufacturing as a Service - On Demand Manufacturing

UC 2.6 Manufacturing as a Service - On Demand Manufacturing Business View

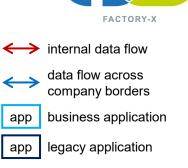
Fraunhofer, Instawerk, Matchory, Siemens

on-demand manufacturing service provider

provides physical product
provides business application
provides services

DMG MORI, TRUMPF
machine builder

Instawerk PAKIC
factory operator

DMG MORI Instawerk PAKIC
customer

automated capacity evaluation application provider (WS1)
DMG MORI, IFW, Siemens, TRUMPF

automatized cost analysis application provider (WS1)
Siemens, TRUMPF

connectivity & user interface application provider (WS2)
DMG MORI, Siemens, Soffico, TRUMPF

automated order proc. application software (WS2)
IFW, Siemens, SmartFactory KL, TRUMPF

quality control application provider (WS2)
MT-Analytics, Siemens, TRUMPF

UC 2.6 Manufacturing as a Service - On Demand Manufacturing Usage View

factory operator

- automized order processing
- automized capacity evaluation
- automized capability evaluation
- automized cost analysis
- connectivity / user interface

OT - shopfloor

- machine
- quality control

on-demand manufacturing service provider

- platform application
- match making
- automized order management

Legend:
- internal data flow
- data flow across company borders
- app — business application
- app — legacy application

- internal data flow: 8
- (dashed red): 0
- data flow across company borders: 2
- (dashed blue): 0

14 May 2025

35

UC 2.6 Manufacturing as a Service - On Demand Manufacturing abstract Business View

supplier

factory operator

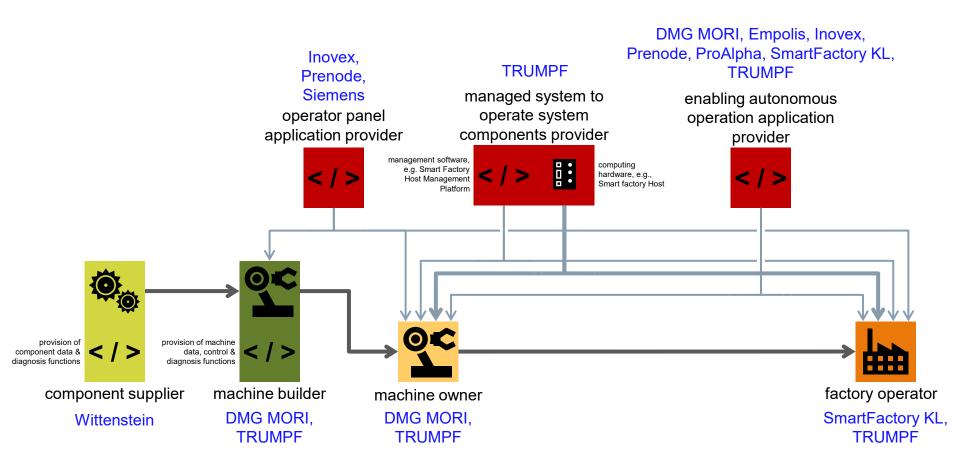on-demand manufacturing service provider

customer

machine builder

Use Case 2.7
Autonomous Operation-as-a-Service
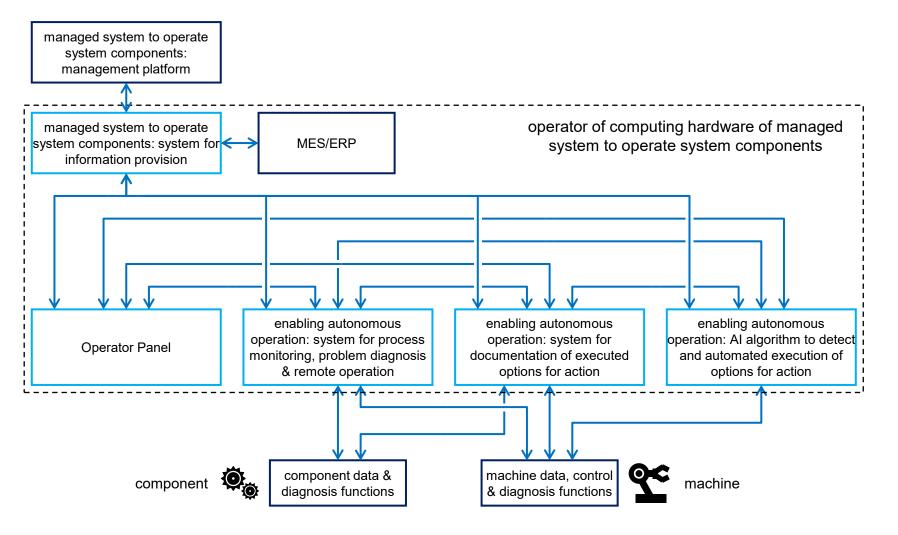
UC 2.7 Autonomous Operation-as-a-Service Business View
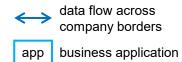
provides physical product
provides business application
provides computing hardware

Inovex, Prenode, Siemens
operator panel application provider

TRUMPF
managed system to operate system components provider

DMG MORI, Empolis, Inovex, Prenode, ProAlpha, SmartFactory KL, TRUMPF
enabling autonomous operation application provider

management software, e.g. Smart Factory Host Management Platform

computing hardware, e.g., Smart factory Host

provision of component data & diagnosis functions

provision of machine data, control & diagnosis functions

component supplier
Wittenstein

machine builder
DMG MORI, TRUMPF

machine owner
DMG MORI, TRUMPF

factory operator
SmartFactory KL, TRUMPF

UC 2.7 Autonomous Operation-as-a-Service Usage View

FACTORY-X

Legend:
- ↔ data flow across company borders
- app — business application
- app — legacy application

Diagram boxes:

- managed system to operate system components: management platform
- managed system to operate system components: system for information provision
- MES/ERP
- operator of computing hardware of managed system to operate system components
- Operator Panel
- enabling autonomous operation: system for process monitoring, problem diagnosis & remote operation
- enabling autonomous operation: system for documentation of executed options for action
- enabling autonomous operation: AI algorithm to detect and automated execution of options for action
- component
- component data & diagnosis functions
- machine data, control & diagnosis functions
- machine

Flow counts:
- ↔ 0 (red solid)
- ‹-› 0 (red dashed)
- ↔ 17 (blue solid)
- ‹-› 0 (blue dashed)

UC 2.7 Autonomous Operation-as-a-Service abstract Business View

factory operator

machine owner

machine builder

component supplier
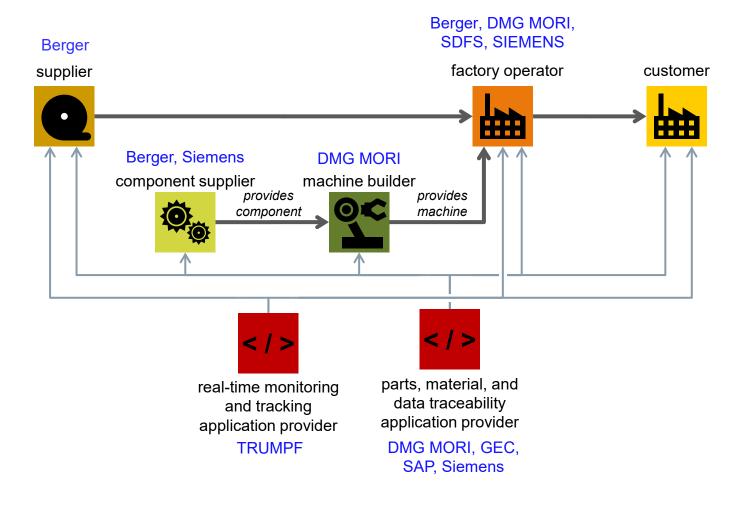
Use Case 2.8 Traceability

UC 2.8 Traceability Usage View
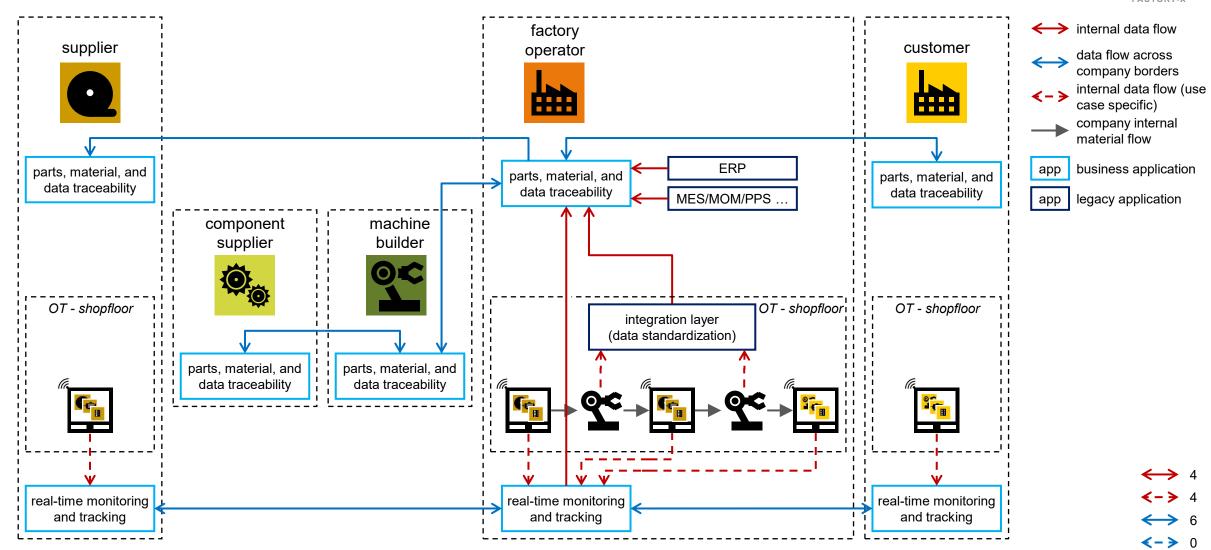
FACTORY-X

Legend:
- ⟷ internal data flow
- ⟷ data flow across company borders
- ⟵- -⟶ internal data flow (use case specific)
- ⟶ company internal material flow
- app business application
- app legacy application

supplier

parts, material, and data traceability

component supplier

machine builder

parts, material, and data traceability

parts, material, and data traceability

factory operator

parts, material, and data traceability

ERP

MES/MOM/PPS …

integration layer (data standardization)

OT - shopfloor

customer

parts, material, and data traceability

OT - shopfloor

OT - shopfloor

real-time monitoring and tracking

real-time monitoring and tracking

real-time monitoring and tracking

⟷ 4
⟵- -⟶ 4
⟷ 6
⟵- -⟶ 0

14 May 2025   43

UC 2.8 Traceability abstract Business View

supplier   factory operator   customer

machine builder

component supplier
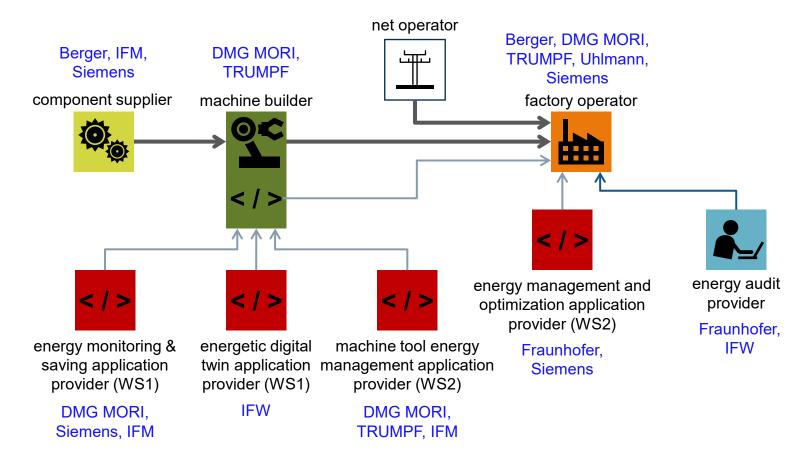
Use Case 2.9
Energy-Consumption & Load Management

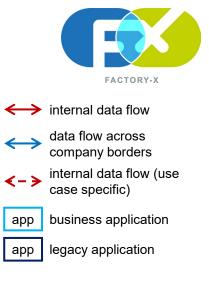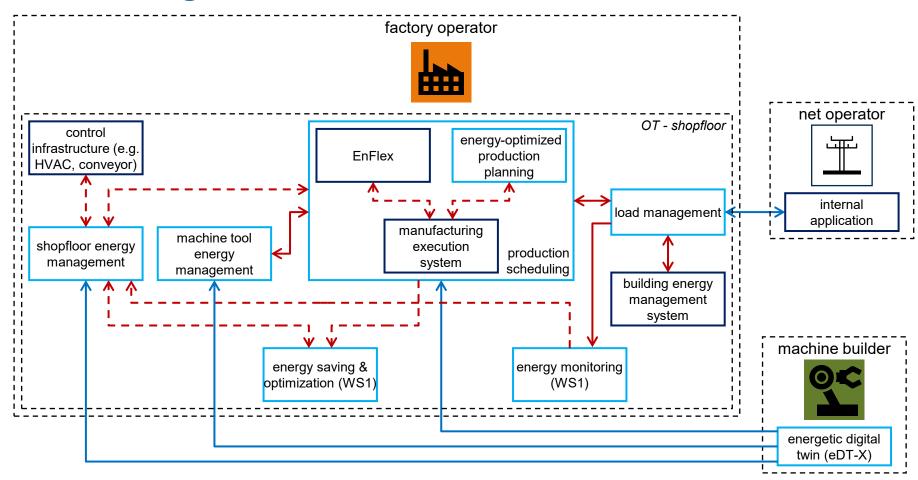# UC 2.9 Energy-Consumption & Load Management Business View

net operator

Berger, IFM, Siemens
component supplier

DMG MORI, TRUMPF
machine builder

Berger, DMG MORI, TRUMPF, Uhlmann, Siemens
factory operator

provides physical product
provides business application
provides auditing services

energy monitoring & saving application provider (WS1)
DMG MORI, Siemens, IFM

energetic digital twin application provider (WS1)
IFW

machine tool energy management application provider (WS2)
DMG MORI, TRUMPF, IFM

energy management and optimization application provider (WS2)
Fraunhofer, Siemens

energy audit provider
Fraunhofer, IFW

UC 2.9 Energy-Consumption & Load Management WS 1 Usage View

UC 2.9 Energy-Consumption & Load Management WS 2 Usage View

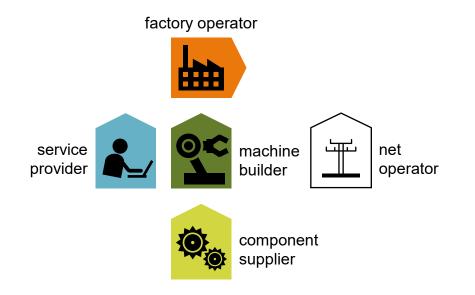# UC 2.9 Energy-Consumption & Load Management abstract Business View

factory operator

service provider

machine builder

net operator

component supplier
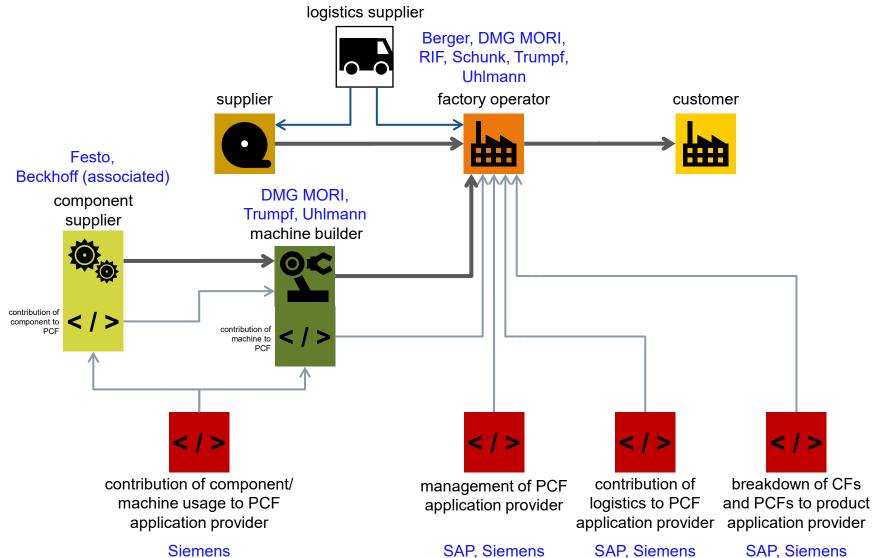
Use Case 2.10
Carbon Footprint Management

UC 2.10 Carbon Footprint Management Business View
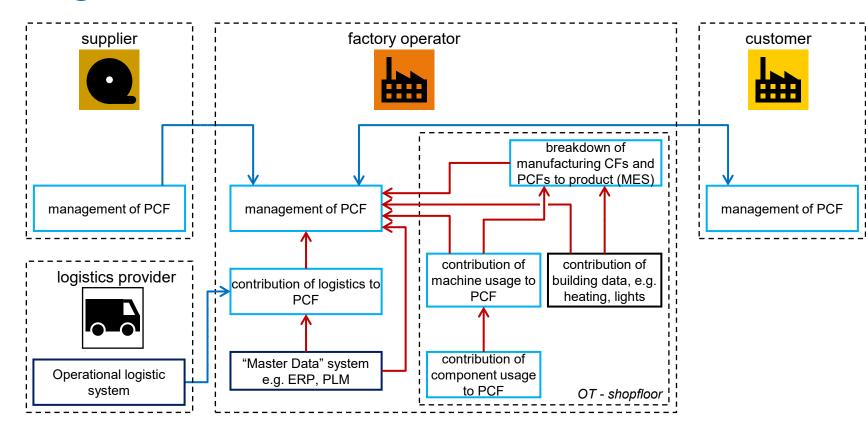
Diagram legend:
- → provides physical product
- → provides business application
- → provides logistics service

logistics supplier

supplier

Berger, DMG MORI, RIF, Schunk, Trumpf, Uhlmann

factory operator

customer

Festo, Beckhoff (associated)

component supplier

contribution of component to PCF

DMG MORI, Trumpf, Uhlmann
machine builder

contribution of machine to PCF

contribution of component/ machine usage to PCF application provider

Siemens

management of PCF application provider

SAP, Siemens

contribution of logistics to PCF application provider

SAP, Siemens

breakdown of CFs and PCFs to product application provider

SAP, Siemens

14 May 2025

51

UC 2.10 Carbon Footprint Management Usage View

supplier

management of PCF

factory operator

management of PCF

breakdown of manufacturing CFs and PCFs to product (MES)

contribution of machine usage to PCF

contribution of building data, e.g. heating, lights

contribution of logistics to PCF

"Master Data" system e.g. ERP, PLM

contribution of component usage to PCF

OT - shopfloor

logistics provider

Operational logistic system

customer

management of PCF

Legend:
- ⟷ internal data flow
- ⟷ data flow across company borders
- app business application
- app legacy application
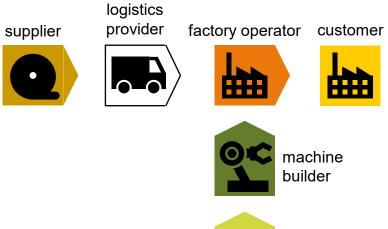
⟷	9
⟵-⟶	0
⟷	3
⟵-⟶	0

UC 2.10 Carbon Footprint Management abstract Business View

supplier

logistics provider

factory operator

customer

machine builder

component supplier
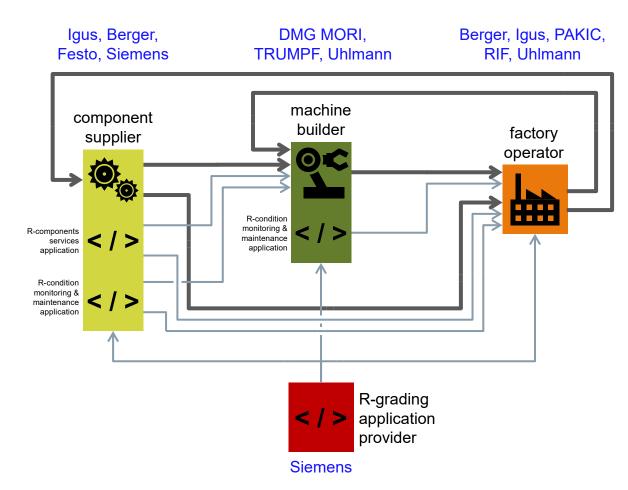
Use Case 2.11
Circular Economy
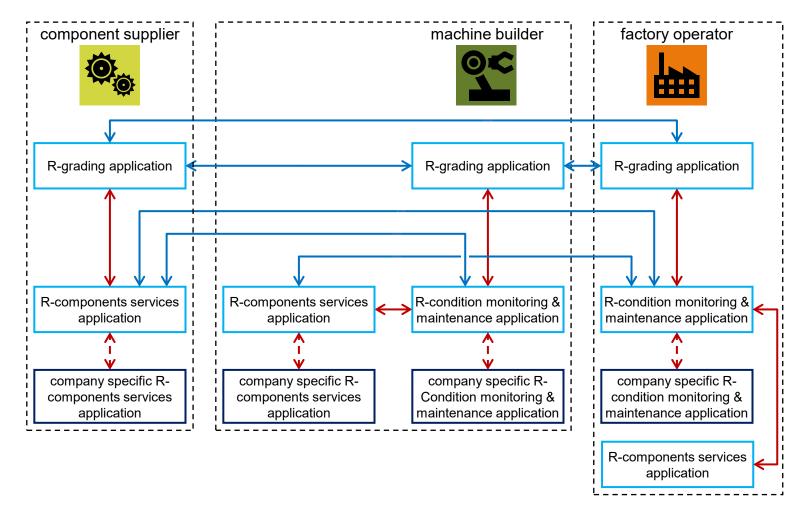
UC 2.11 Circular Economy Business View

UC 2.11 Circular Economy Usage View
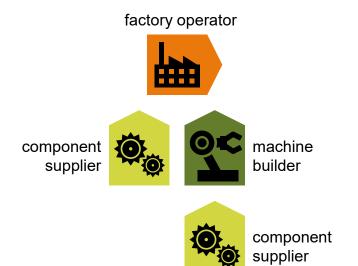
UC 2.11 Circular Economy abstract Business View

factory operator

component supplier

machine builder

component supplier

Thank you

Contact information:

ulrich.loewen@siemens.com

info@factory-x.org

www.factory-x.org

FACTORY-X