LCAMP

CONFERENCE 2024

LEARNING FACTORIES FOR ADVANCED MANUFACTURING IN EDUCATION

14-15 MAY

OSTERTAG event Centre
Aalen, Germany

Co-funded by the European Union

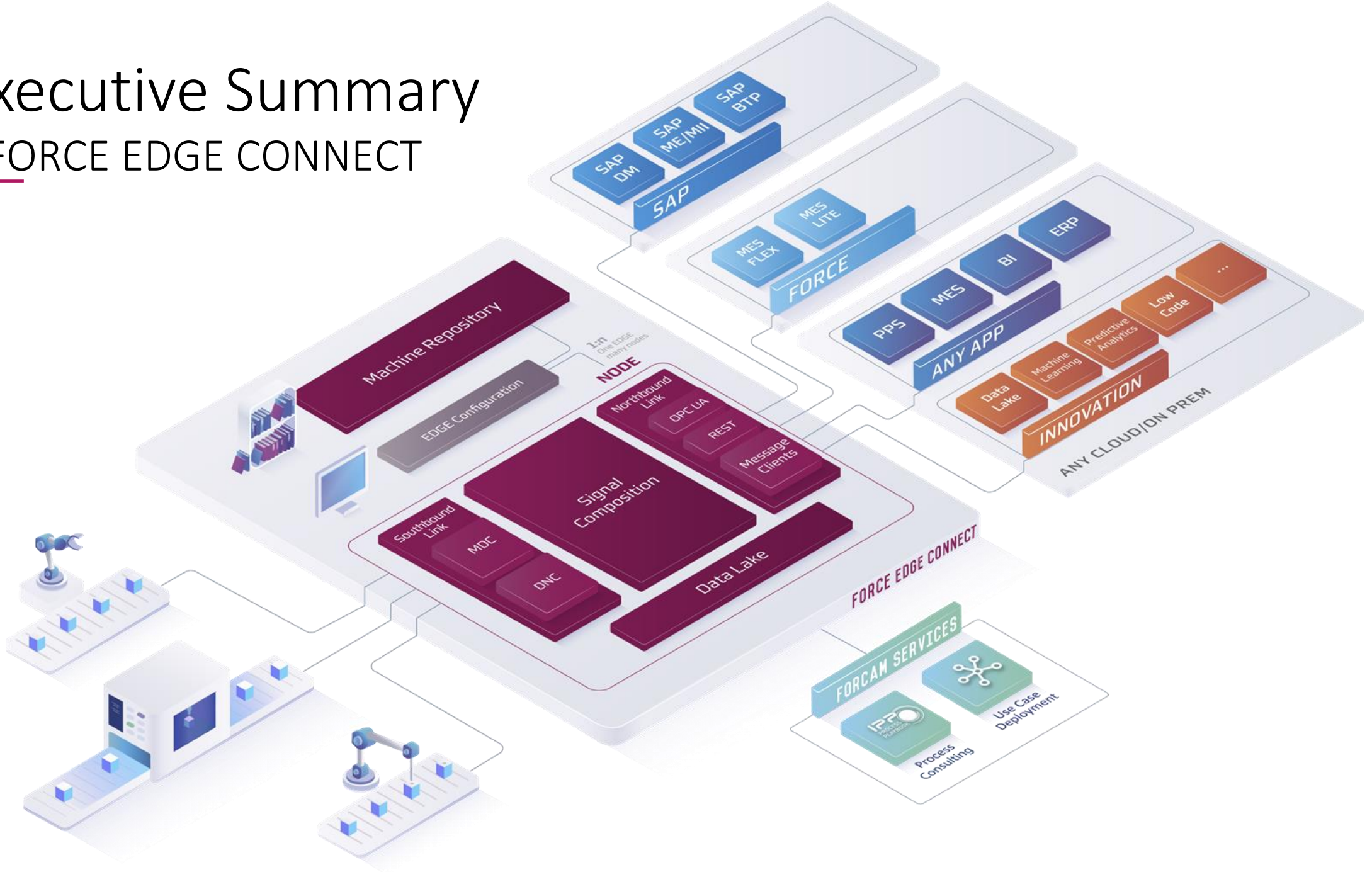
Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

How to connect Machines

FORCE EDGE CONNECT in a Nuthsell

Executive Summary

- FORCE EDGE CONNECT



Executive Summary

• FORCE EDGE CONNECT sweet spots

- High amount of available PLC Plug-ins and protocols for machine communication
- User friendly Ui with an integrated wizard for a guided process for machine connection
- Graphical signal composition for building a standardized machine event model
- Openness for 3rd party system via REST, OPC UA, MQTT, KAFKA and NATS.io
- Machine Repository to build a connectivity library for faster connection of machines
- Bidirectional communication between OT and IT for machine data and Nc-file transfer
- Scalable architecture with a central configuration instance

Executive View

- FORCE EDGE CONNECT closes the gap between the machine (OT) layer and IT layer

3rd party/External:

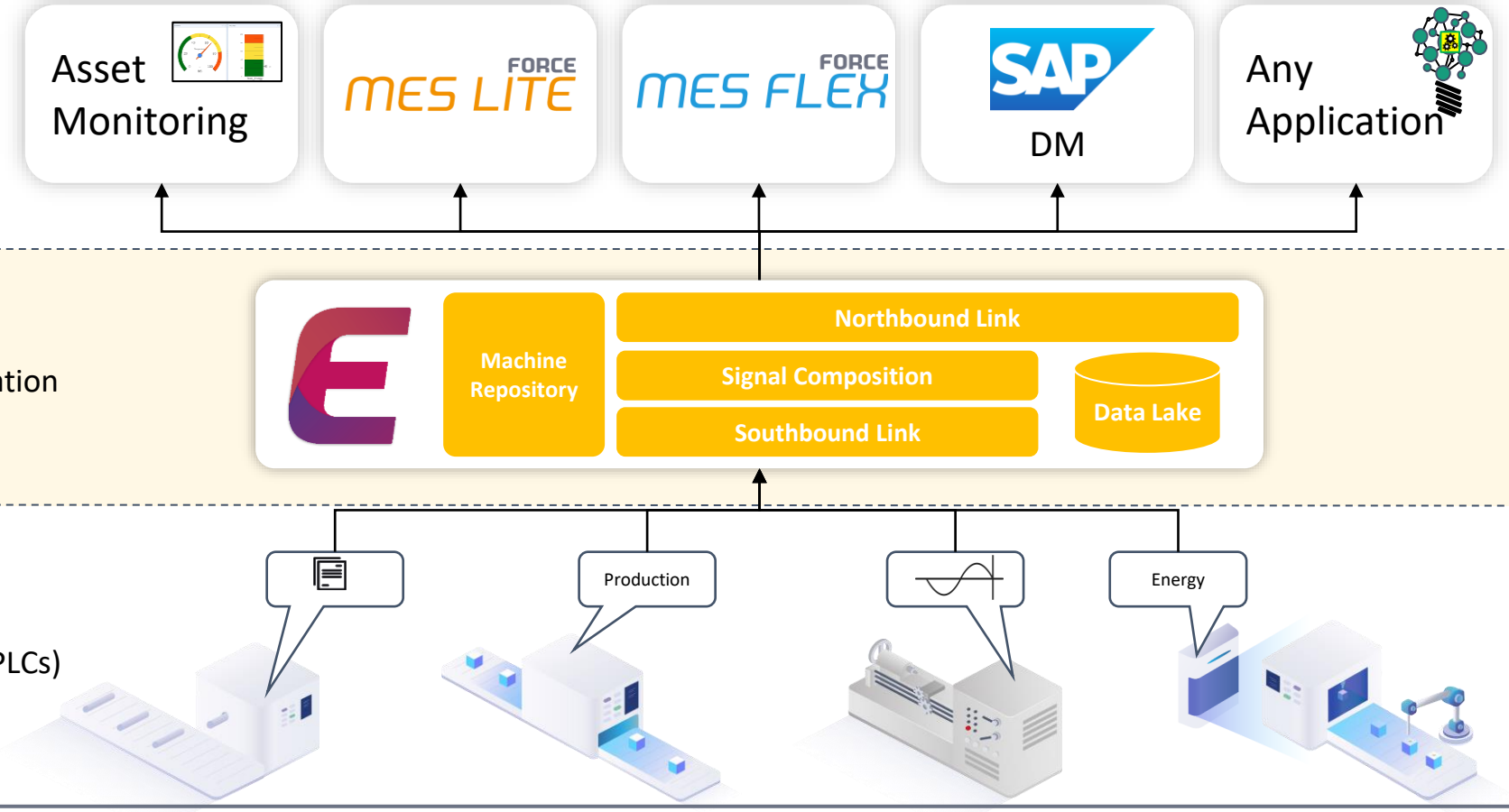
- MES solutions
- Predictive solutions
- Visualization & Reporting
- ….

FORCE EDGE CONNECT:

- Connectivity solution
- Event standardization & harmonization
- Templates for machine connection
- Scalable architecture

Shopfloor:

- Brownfield (existing machinery & PLCs)
- Heterogeneous machine signals



Management View

- FORCE EDGE CONNECT – Southbound Link

Southbound link – Connection to the shopfloor

- MDC (Machine Data Connection)
  - Native plug-ins for common PLCs
  - Bidirectional communication (if supported by PLC)
  - Protocol-based data collection
- DNC (Distributed Numerical Control)
  - Transfer and receive NC files

MDC Plug-ins*

EUROMAP 63
EUROMAP 77
Mazak
FANUC
OMRON
WAGO
HEIDENHAIN
OPC FOUNDATION
MQTT
SIEMENS
MTConnect
OMRON
Modbus
Node-RED
Rockwell Automation

DNC Plug-ins*

Mazak
MCIS-RPC
FANUC
FTP
W&T www.WuT.de
COM
HEIDENHAIN
MOXA

*Overview. Please contact us for the complete list

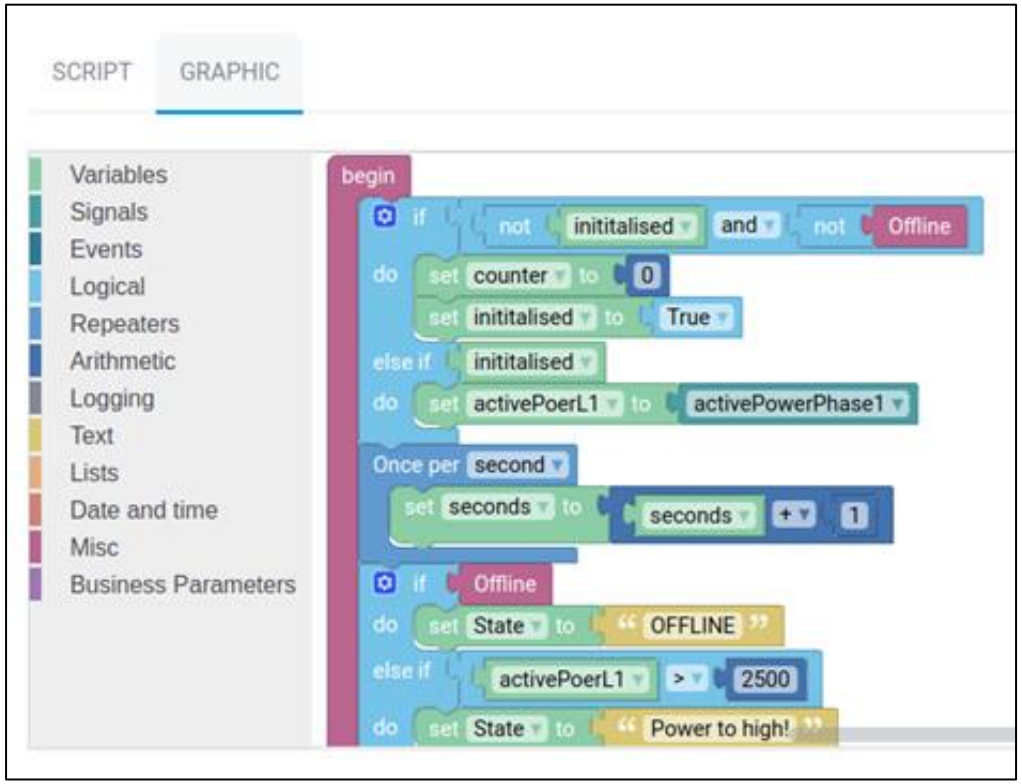
Management View

- FORCE EDGE CONNECT – Signal Composition

From Signal to Meaning

- Normalization of heterogeneous data
- Creating a standard data model
  (From OT to IT)
- Reducing the effort in higher-level IT systems

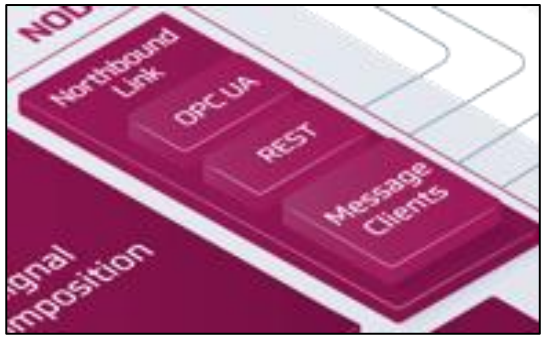
Graphical Composition for an easy start



Light-Weight scripting language for advanced users

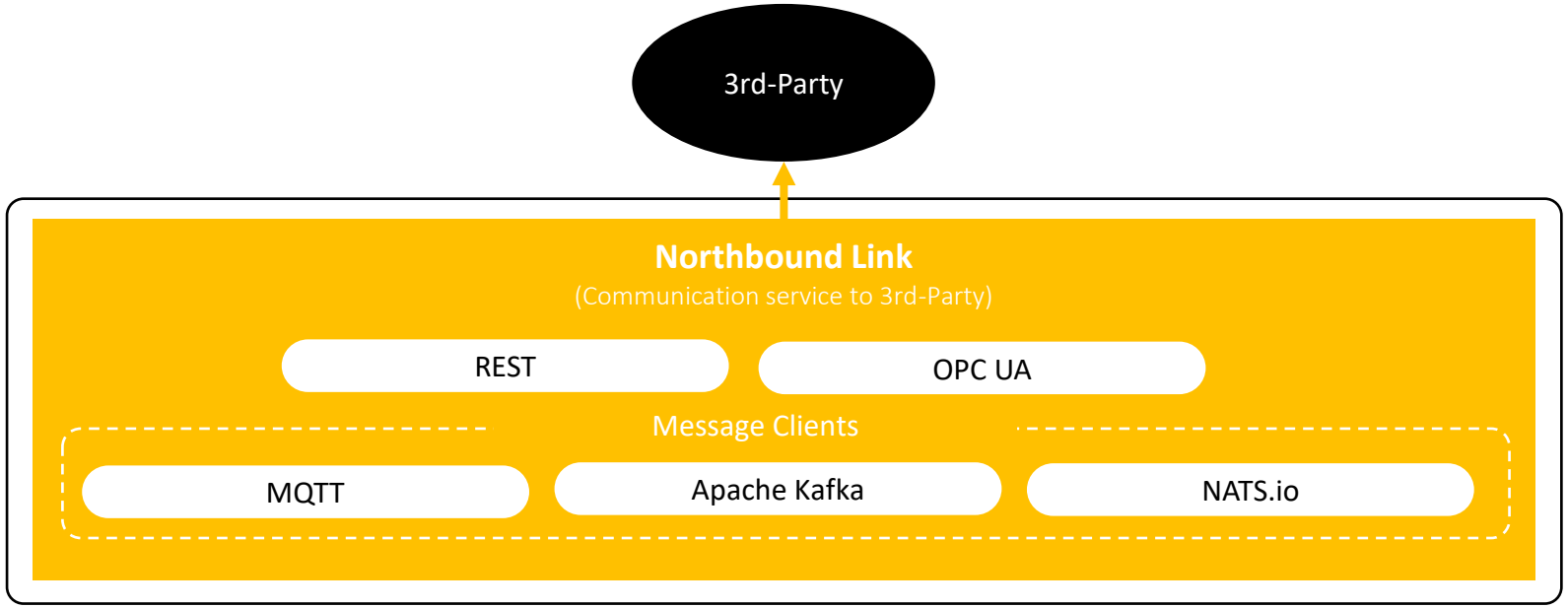
Management View

- FORCE EDGE CONNECT – Northbound Link



Northbound link – Open for any IT-System

- REST & OPC UA
  - Life data
  - Historian Data (needs Data Lake)
  - Bidirectional communication
- MQTT
  - Life data
  - Bidirectional communication
- Apache Kafka & NATS.io
  - Life data

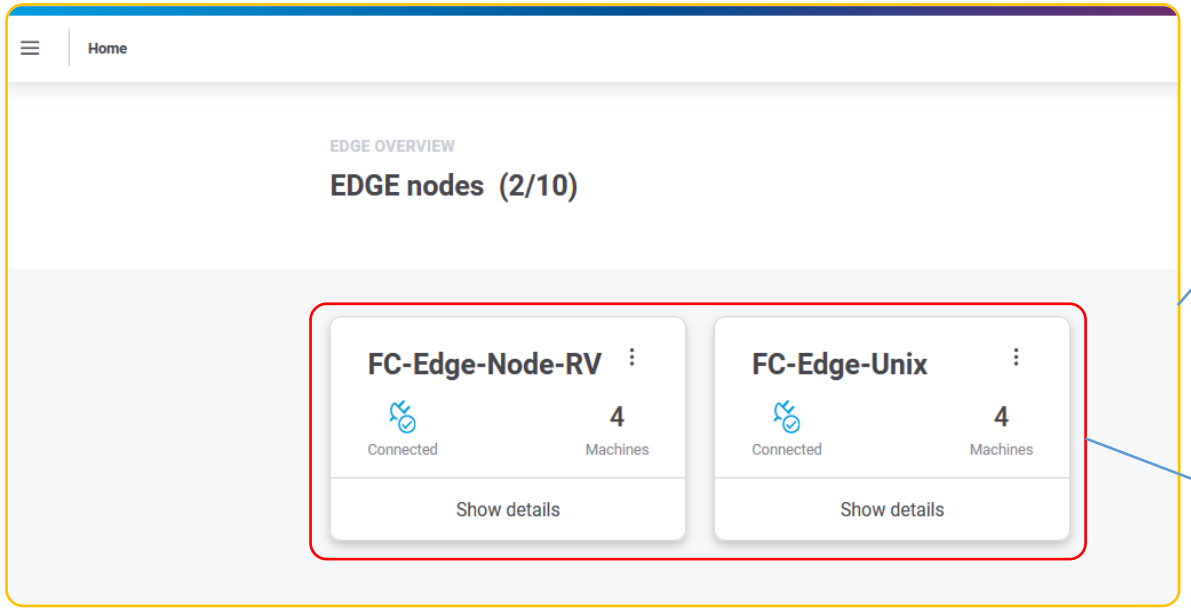


Management View

- FORCE EDGE CONNECT – Configuration

Configuration

- Central Configuration
- Node Management
- User Management



Central Configuration

De-Central EDGE Nodes

Management View

- FORCE EDGE CONNECT – Machine Repository

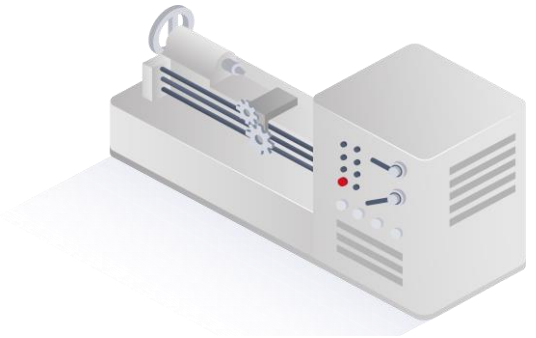
Customer-Specific Connectivity Library

- Build up your own library of connectivity configurations
- Templates contain the relevant connectivity information for a machine type or use case
- Re-use templates to connect the same or similar machine types
- Create comparability of the machine data
- Significantly speed up rollout

Machine Repository

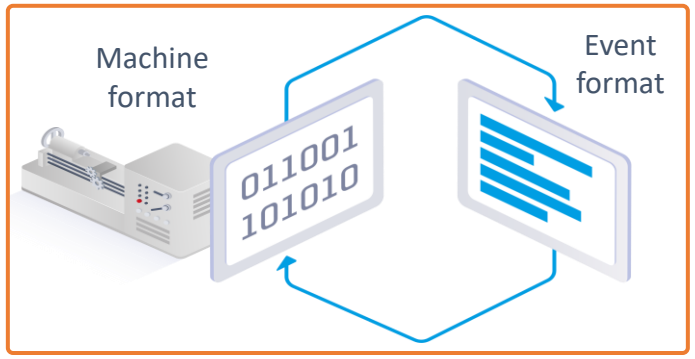
Machine template

Faster connection



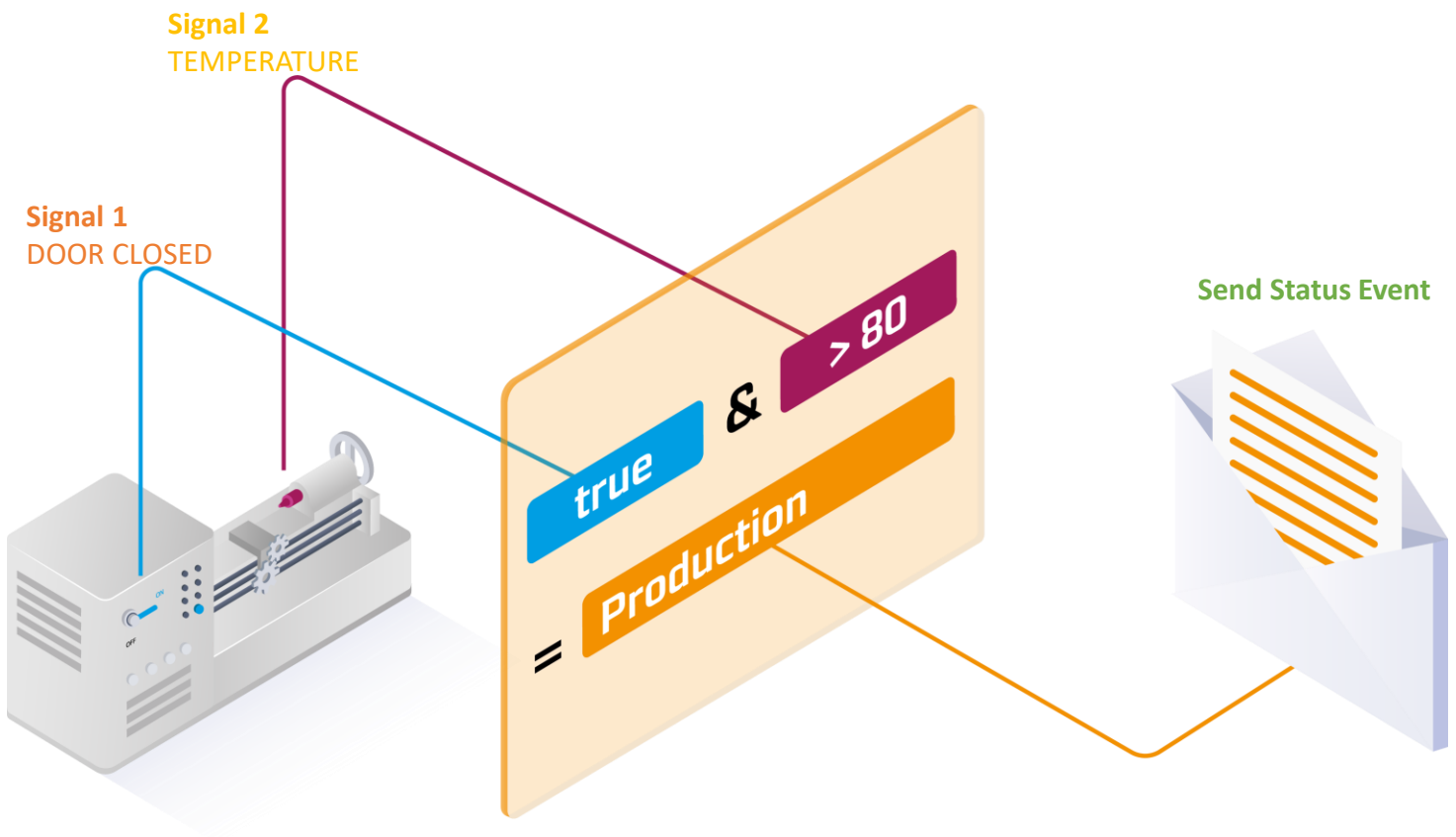
Blueprint View

- FORCE EDGE CONNECT – Signal Composition



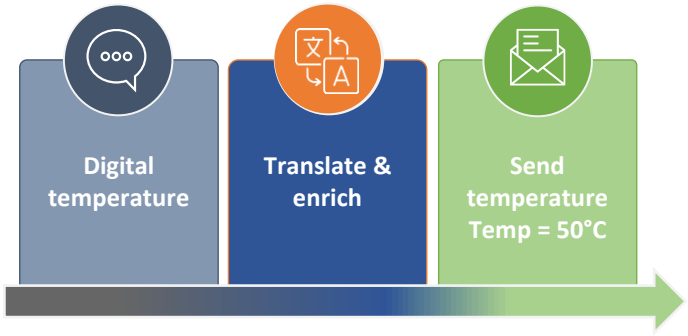
From signal to meaning:

- Create production-related semantics based on the collected signals
- E.g., create machine state from signals (one signal/combination of signals)
- Configurable event model



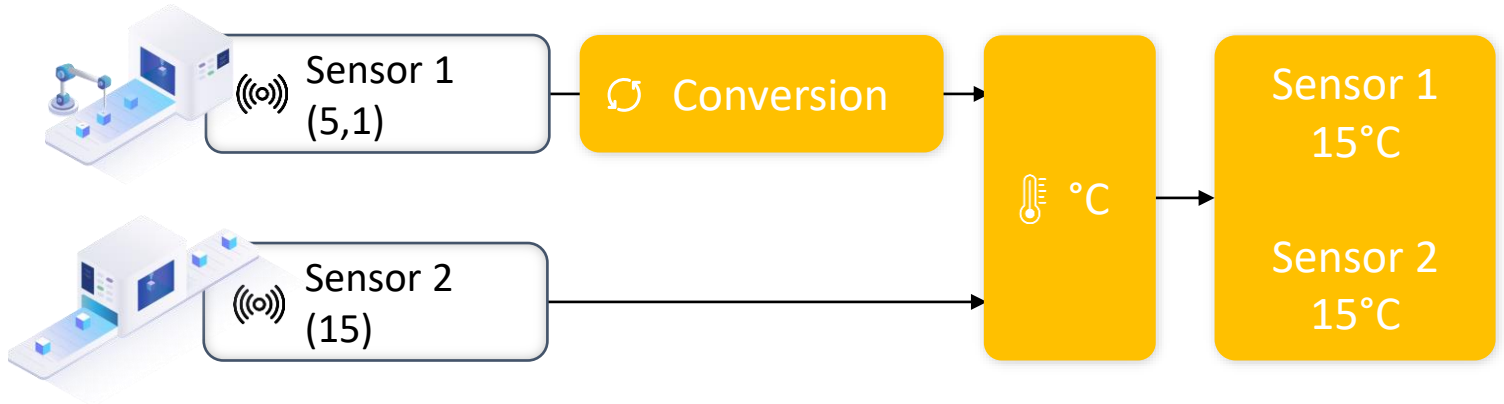
Blueprint View

- FORCE EDGE CONNECT – Signal Composition



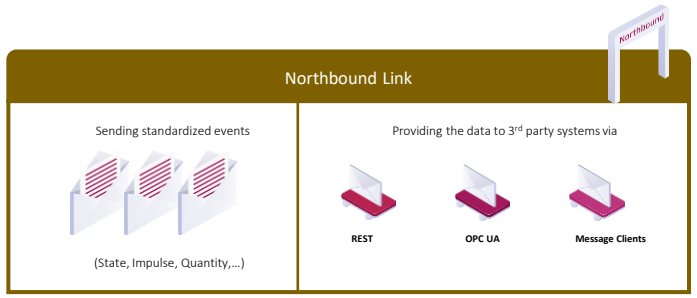
From signal to meaning:

- Process data e.g.
  - Temperature/energy value/…
- Integration of physical units
  - °C/kWh/…
- Conversion of sensor data into real values



Blueprint View

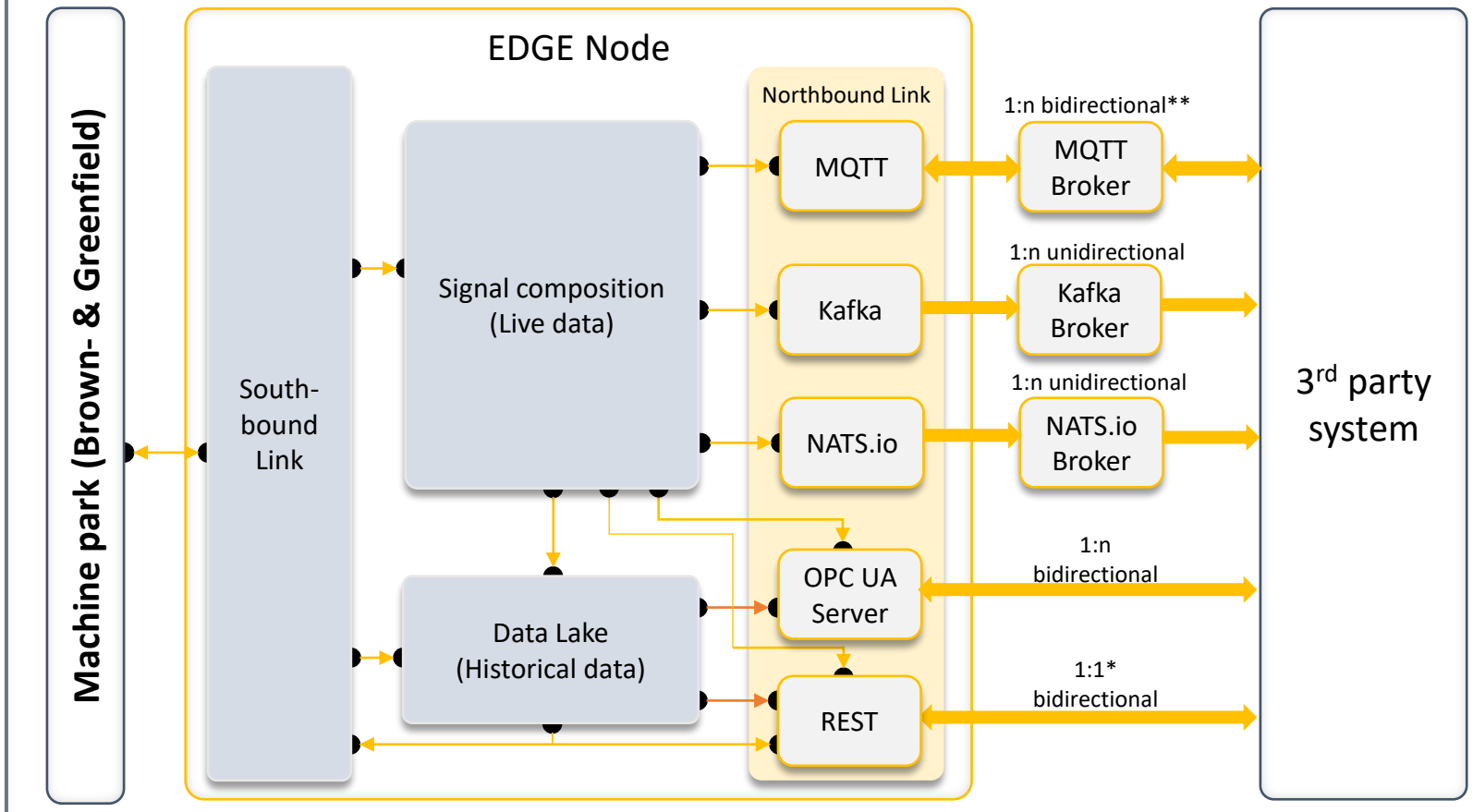
- Interaction Process Flow



EDGE CONNECT Northbound Link

Deliver machine data from FORCE EDGE CONNECT to 3rd party systems

- Live data:
  REST/MQTT/OPC UA/Kafka/NATS.io
- Historical data:
  REST/OPC UA



*writing n systems possible
**bidirectional: sending from 3rd party system via MQTT (business parameter and signal values)

Thank you ☺
See you @ the EDGE Demo