



# COCOP- Coordinating Optimisation of Complex Industrial Processes

## Communication architecture for plant wide optimisation



Horizon 2020



@CocopSpire

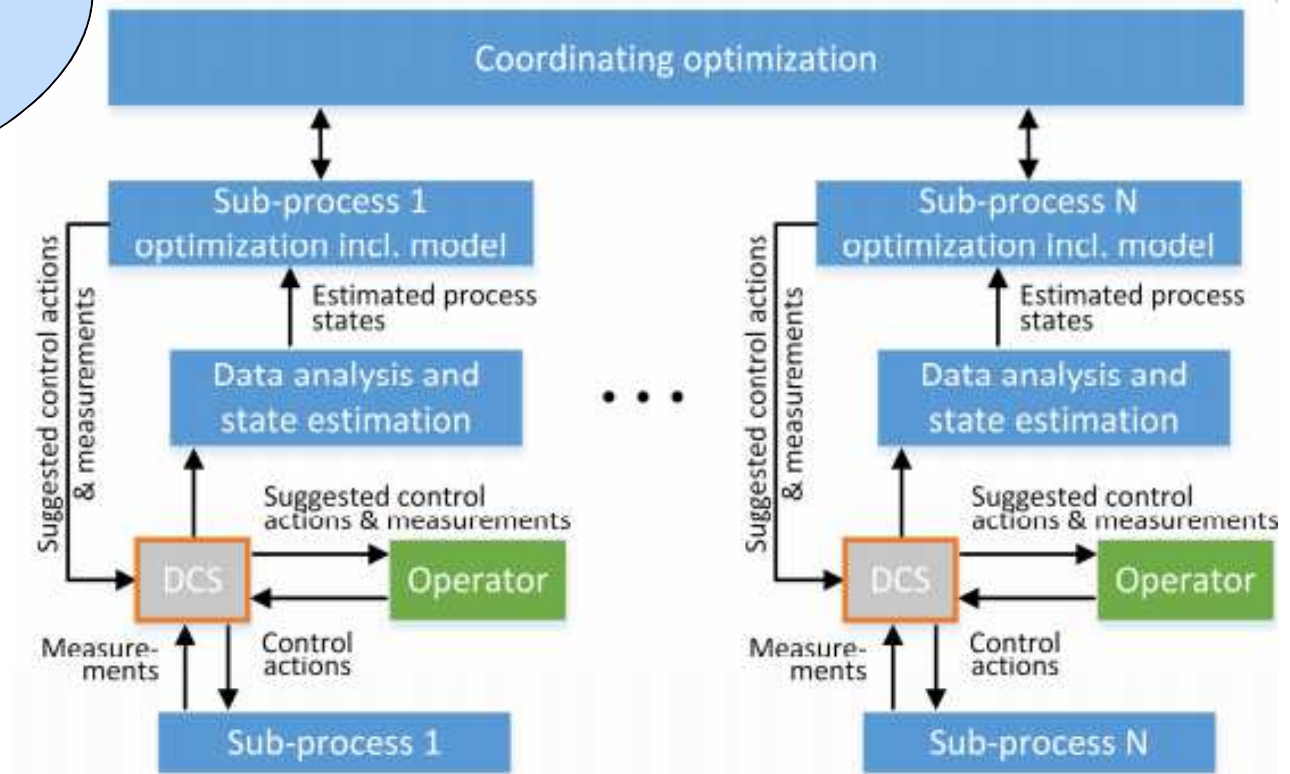
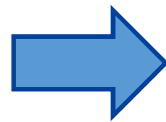
- Overall goal of COCOP
- COCOP targets
- Needs regarding the architecture
- Proposed architecture
- SDK
- Example applications

# Overall goal: project scope

The COCOP architecture should enable the **coordinating optimisation** of production systems. This is in contrast to conventional optimisation tools that mostly address the local optimisation of unit processes.

To enable plant-wide monitoring and control by using the model-based, predictive, coordinating optimisation concept in integration with plant's automation systems

UNIT PROCESS



## COCOP targets

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Enable plant-wide optimisation

Distributed, loosely coupled system

Static and Dynamic environments

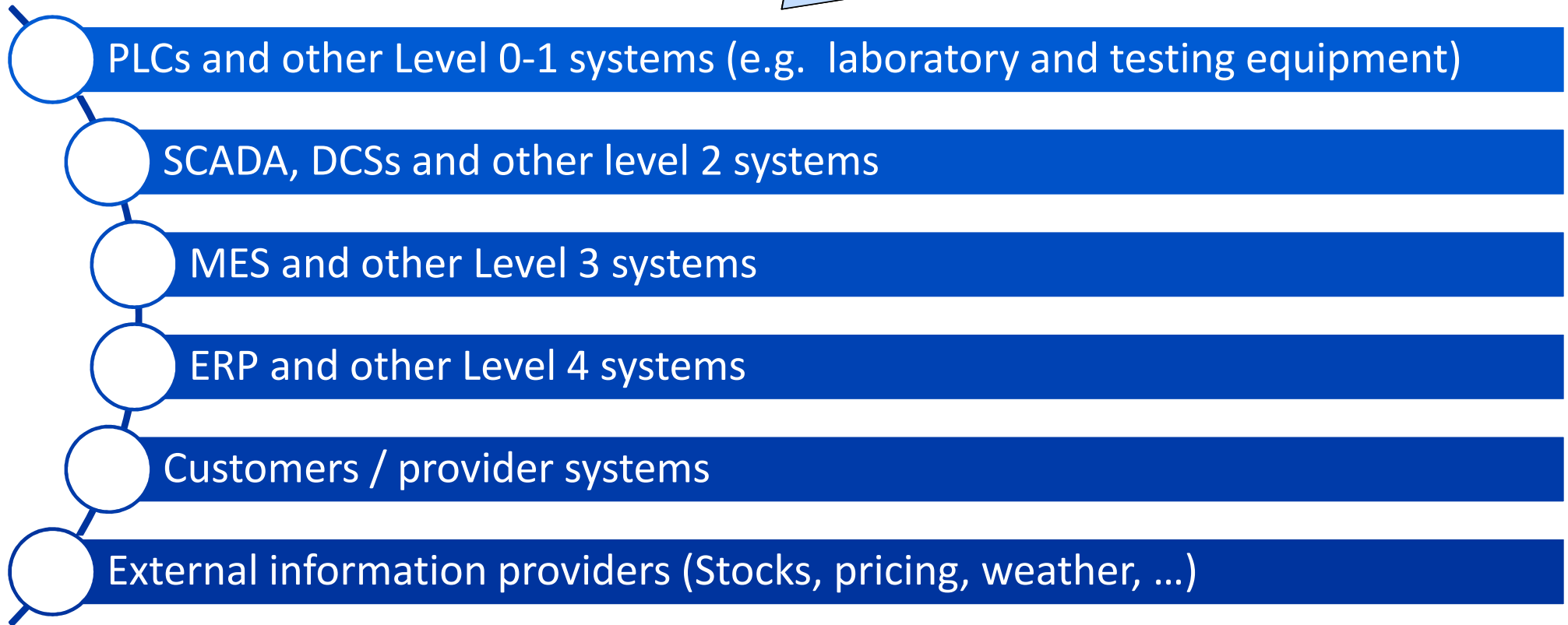
Compatibility with different vendors and systems

Flexibility for integrator implementation

## Architecture needs: system connectivity needs

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The systems that should be interconnected are heterogeneous, and they reside in various levels of production systems.



# Architecture needs: covered industries



The COCOP pilot cases are steel and copper production. In addition, the results are transferable to - at least - chemical industry and water treatment.

**PILOT CASES**



**TRANSFERABILITY ANALYSIS**



**EUROPEAN INDUSTRIES**

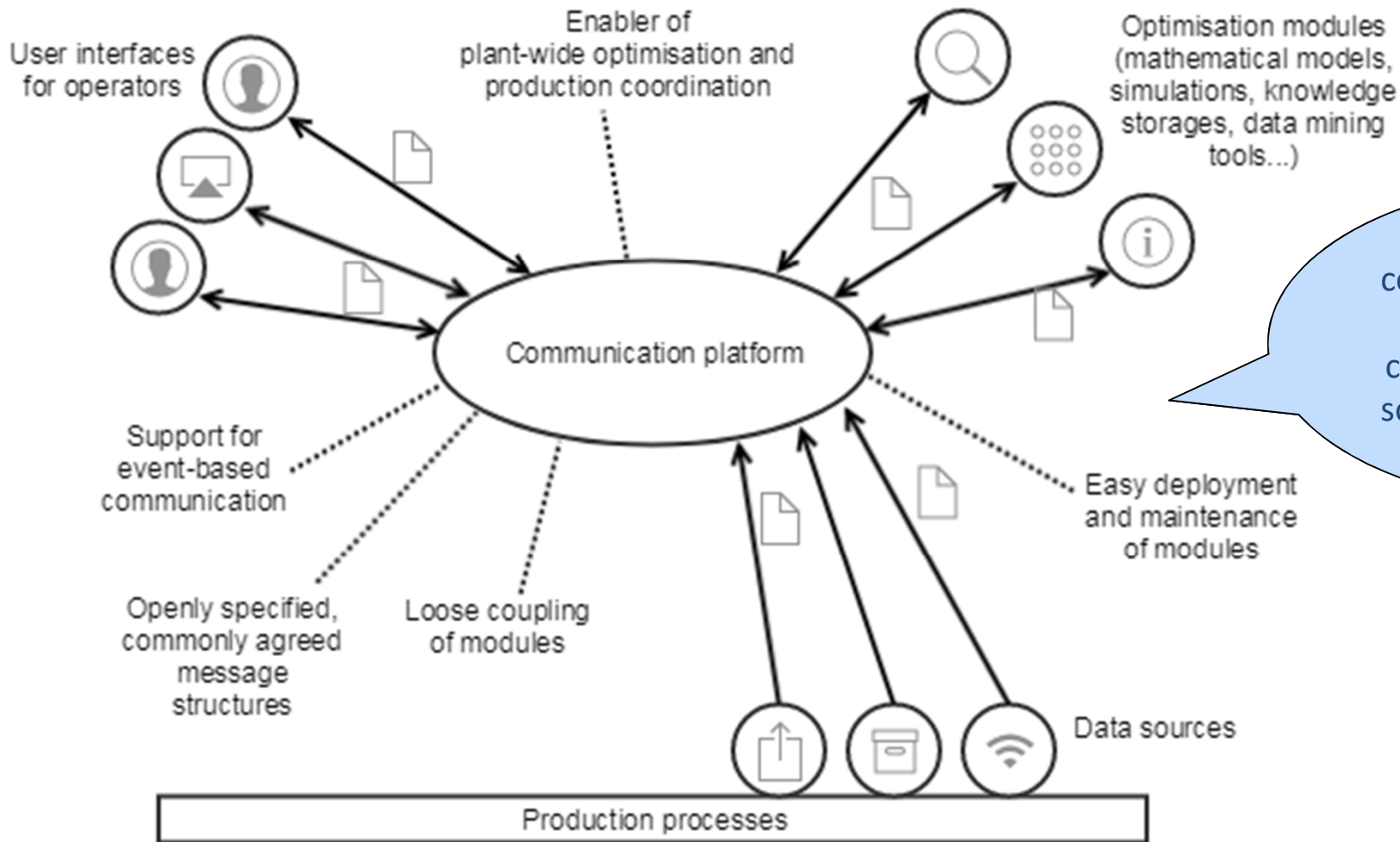
**STEEL INDUSTRY  
SIDENOR**

**COPPER INDUSTRY  
OUTOTEC**

**CHEMICAL INDUSTRY  
DSM**

**WATER TREATMENT  
MSI**

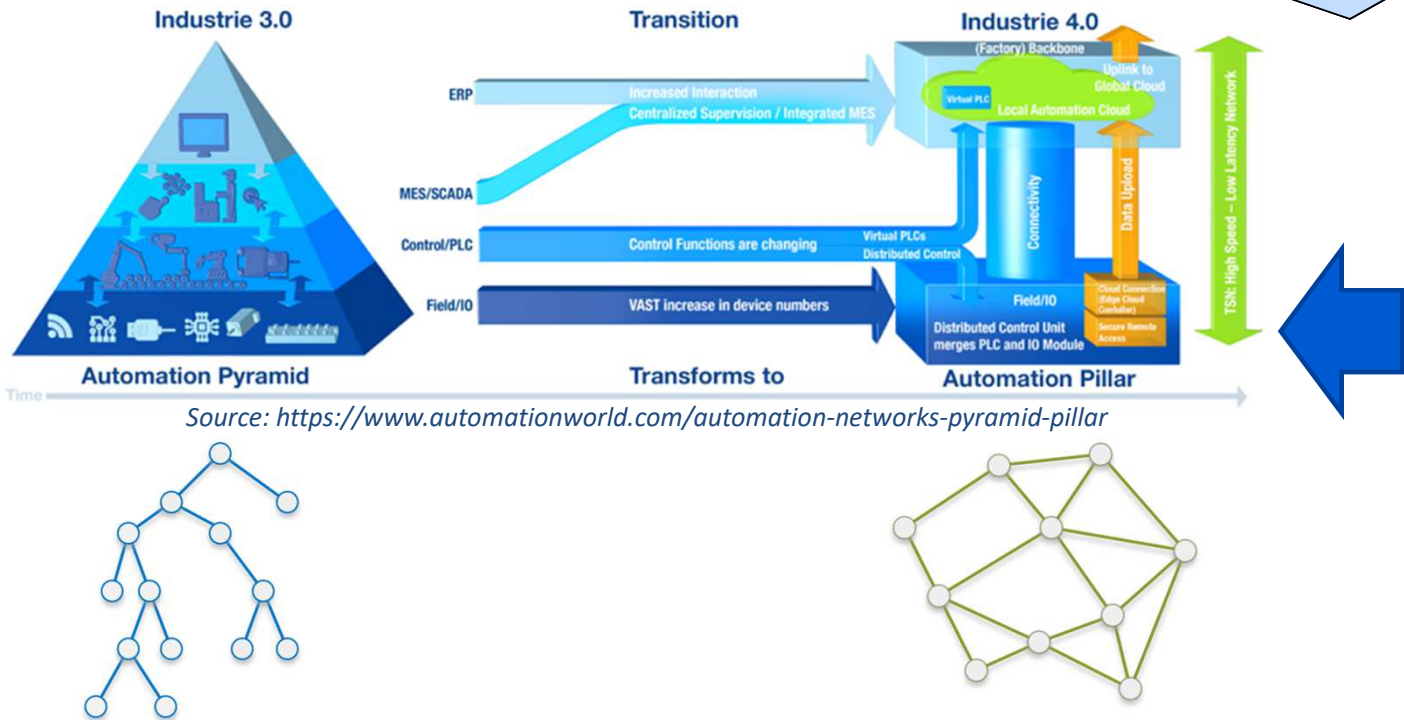
# Proposed architecture: general scheme



The aim of the communication platform is to connect various data consumers to various data sources, regardless of their platform and type.

# Proposed architecture: fulfilling Industry 4.0 needs

The architecture contributes to flexible systems integration in the spirit of Industry 4.0. The vision is to replace the conventional strict, inflexible hierarchy of physical automation systems with decoupled systems and event-driven control execution.



**Loosely coupled elements**

**Distributed architecture**

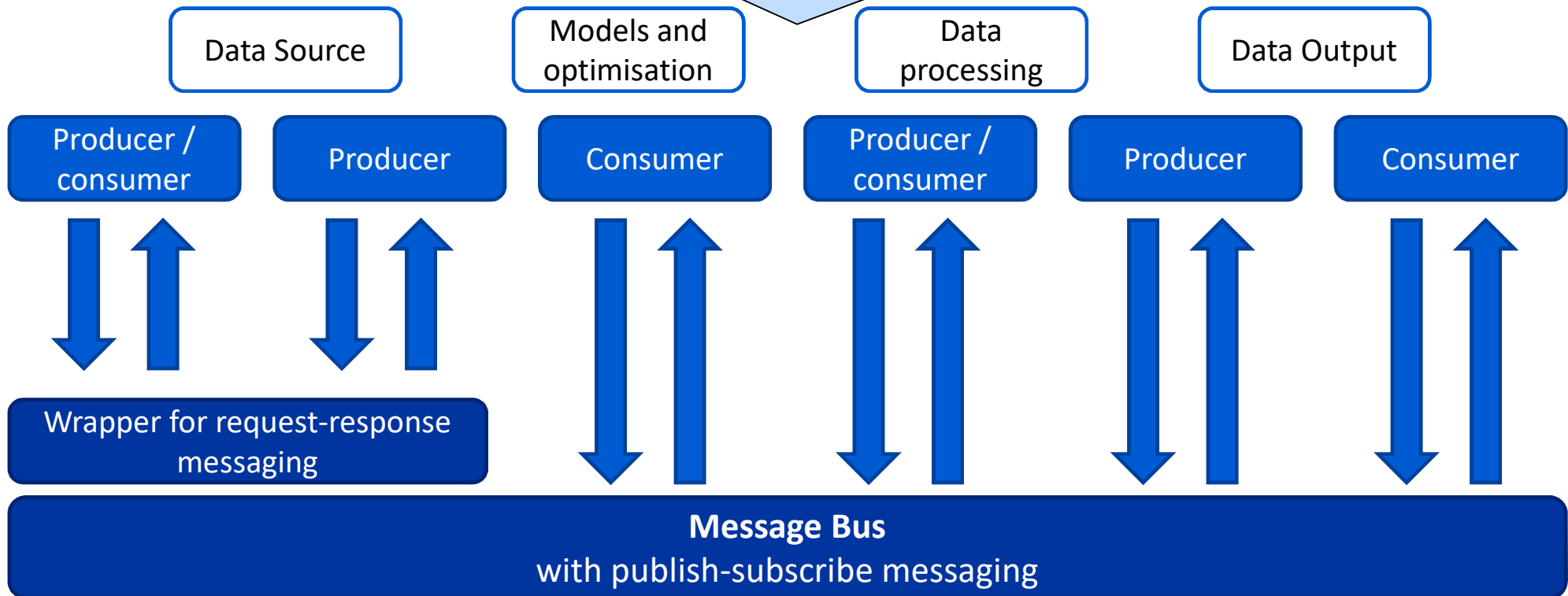
**Event driven implementation**

**Data driven foundation**



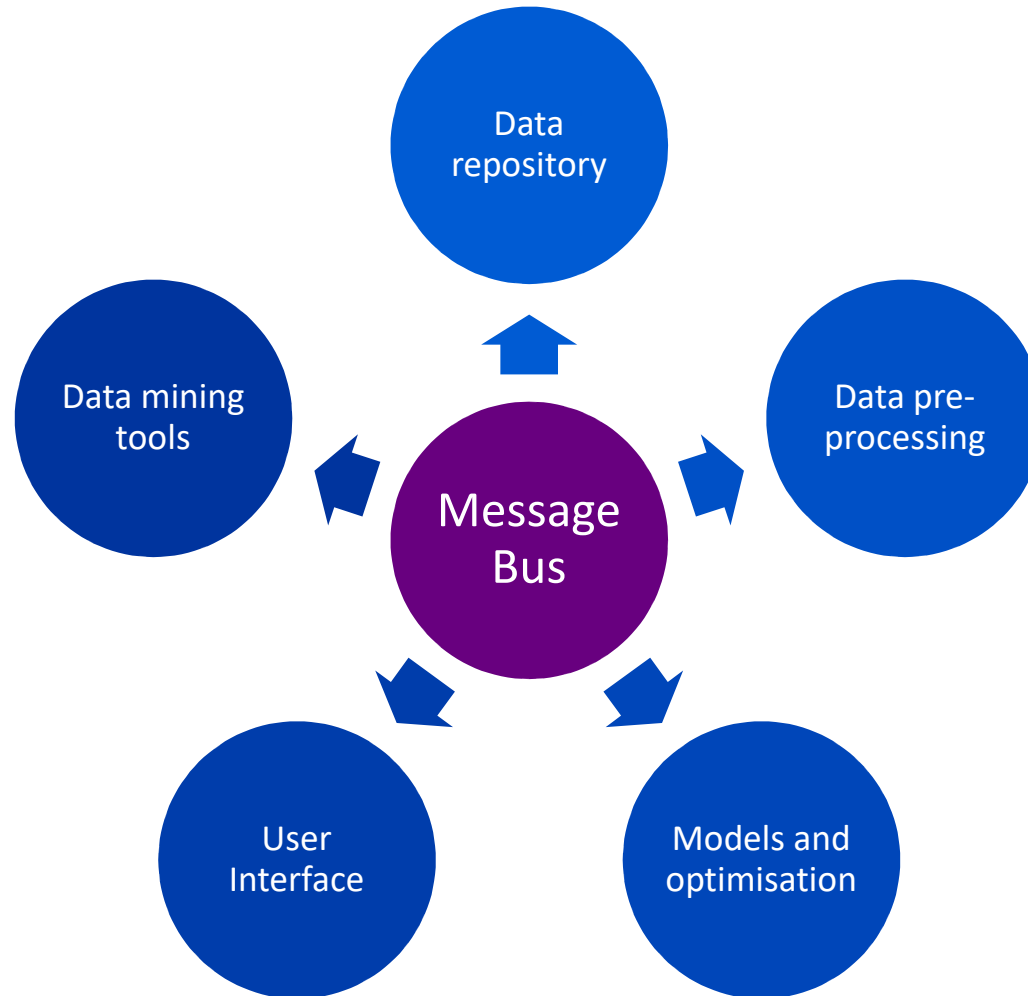
# Proposed architecture: message Bus

A message bus is utilised to enable publish-subscribe messaging. With this approach, it is straightforward to implement event-based applications. The more conventional request-response messaging is also possible.



## Proposed architecture: entities connected to the bus

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A SDK has been implemented for .NET and Java. The messaging is based on the AMQP protocol. Software libraries perform the serialisation of messages that conform to open standards. A process data publisher also exists to publish data to the message bus.



**AMQP-based message bus implementation**

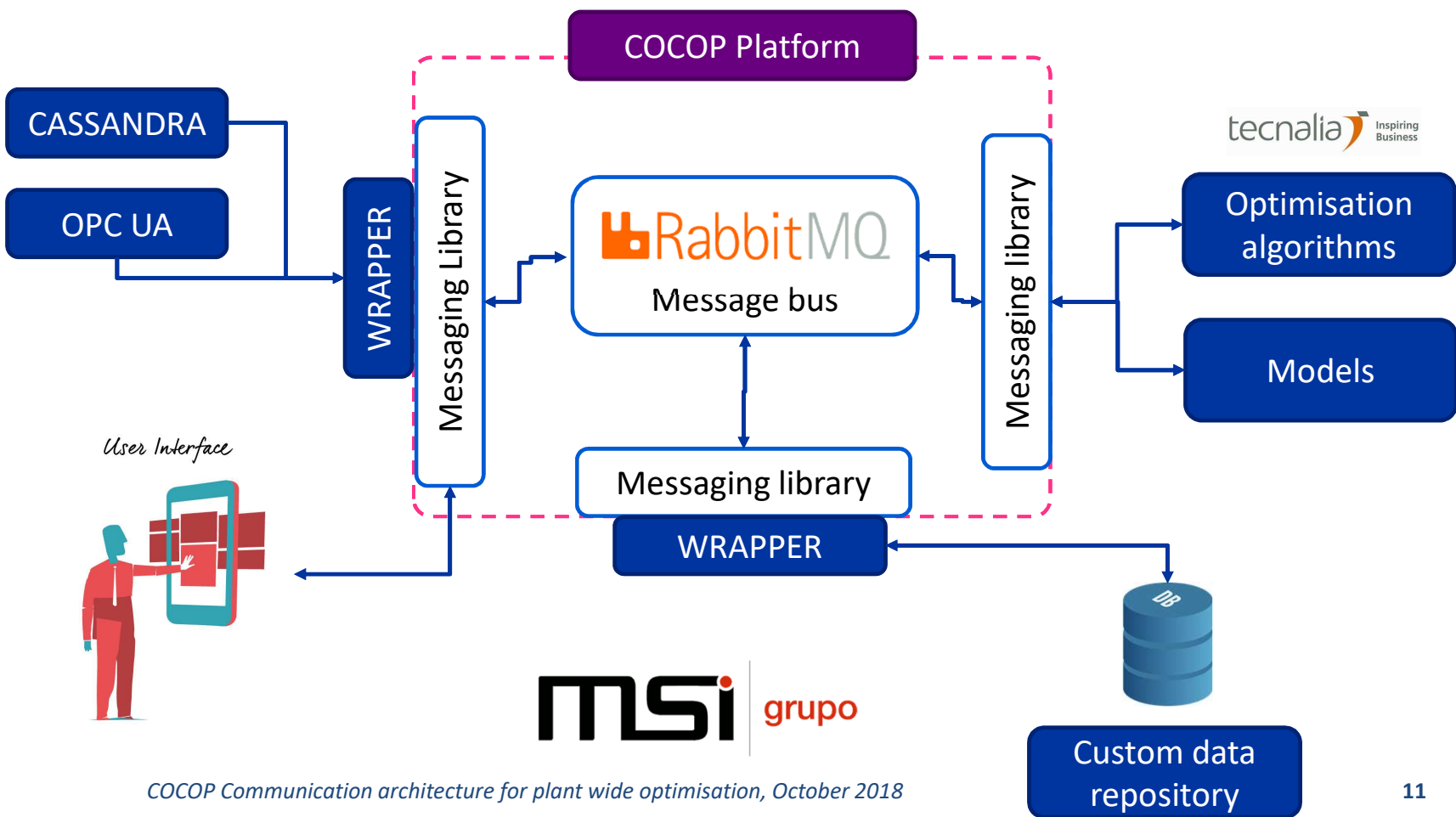
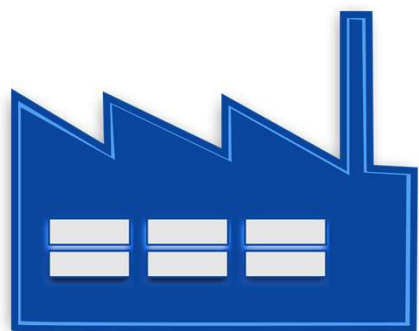
**Messaging Library**

- **Measurements, including complex structures**
- **Request response**
- **Task control**

**Process Data Publisher**

**Resource discovery system**

# Example of application: steel pilot case



COCOP Communication architecture for plant wide optimisation, October 2018



# Thank you for your attention!

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