



## Integrated modelling for sustainable and optimized steel manufacturing processes

### PROJECT IN BRIEF

ProcTwin develops a digital twin-based demonstration platform to predict, visualize and optimize interconnected steel manufacturing processes.

The project combines physics-based numerical models, industrial data, soft sensors and distributed machine learning to improve energy efficiency, product quality and operator decision support across the steel production chain.

### OBJECTIVES

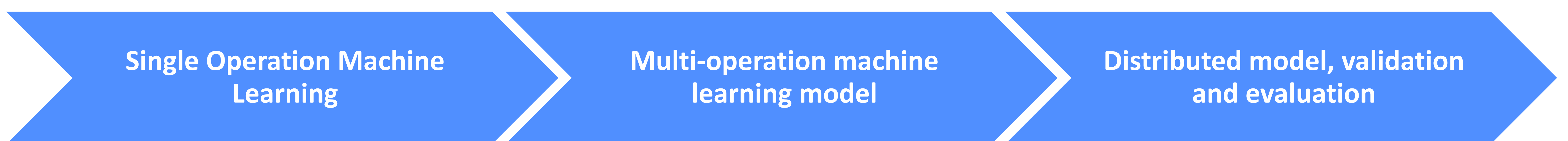
- **Integrate process models**  
Connecting key production stages
- **Develop advanced soft sensors and data integration**  
Enabling secure and efficient data handling
- **Develop distributed machine learning models**  
Predicting and optimizing using industrial data
- **Validate in industrial use cases**  
Demonstrating at Celsa/GSW (Spain) and SSAB (Sweden)
- **Facilitate sector-wide adoption**  
Using visualization and decision-support tools

### SEMANTIC INTEROPERABILITY

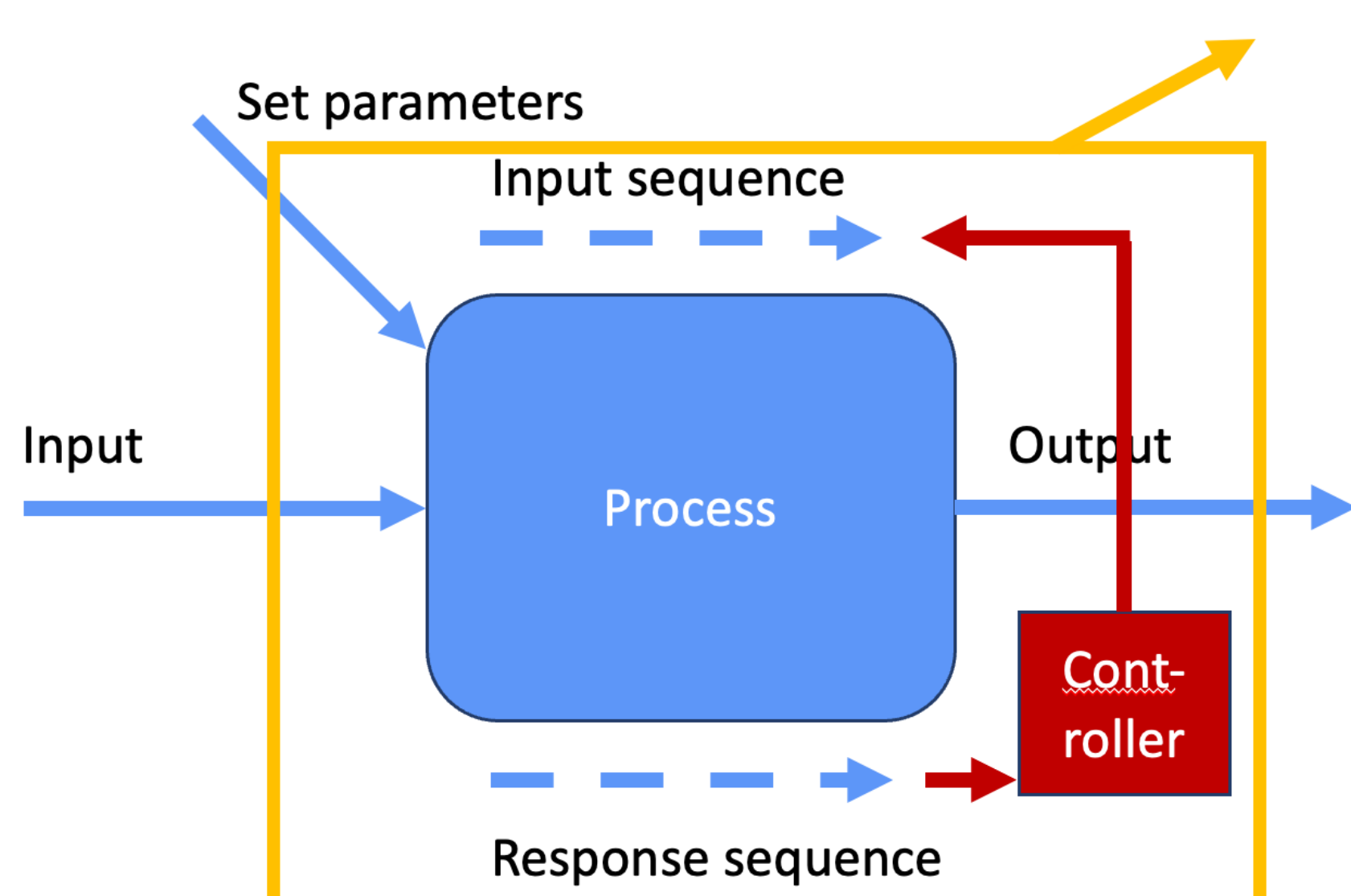
Enabling meaningful data exchange and AI collaboration across systems, models and process steps.

- API-based communication for real-time data exchange
- Communication between local and global AI models
- Metadata-driven interpretation of data across processes
- Secure data integration for scalable digital twin deployment in industrial environments

### STEP-WISE DEVELOPMENT OF DISTRIBUTED AI

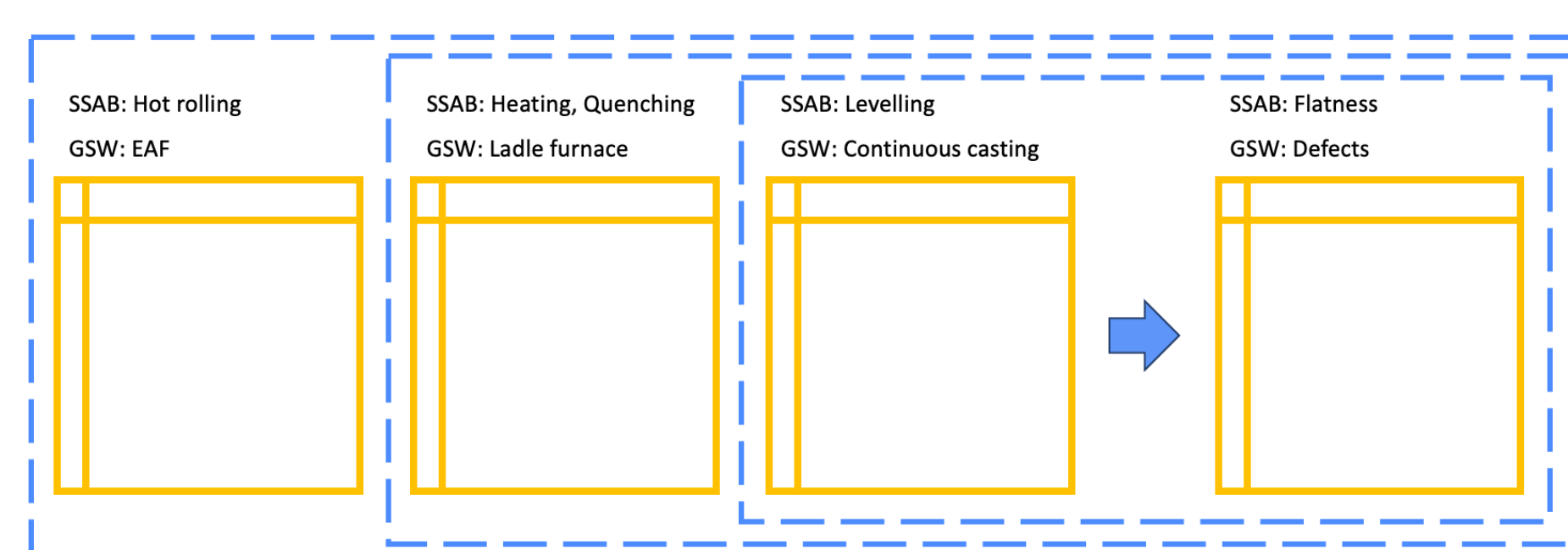


#### Integration of data-driven models and existing physical models



#### Integration of data-driven models and existing physical models over multiple machine operations

- Communication infrastructure establishment
- Multi sub-model integration
- Approach implementation and validation



#### Development and validation of the distributed AI approach

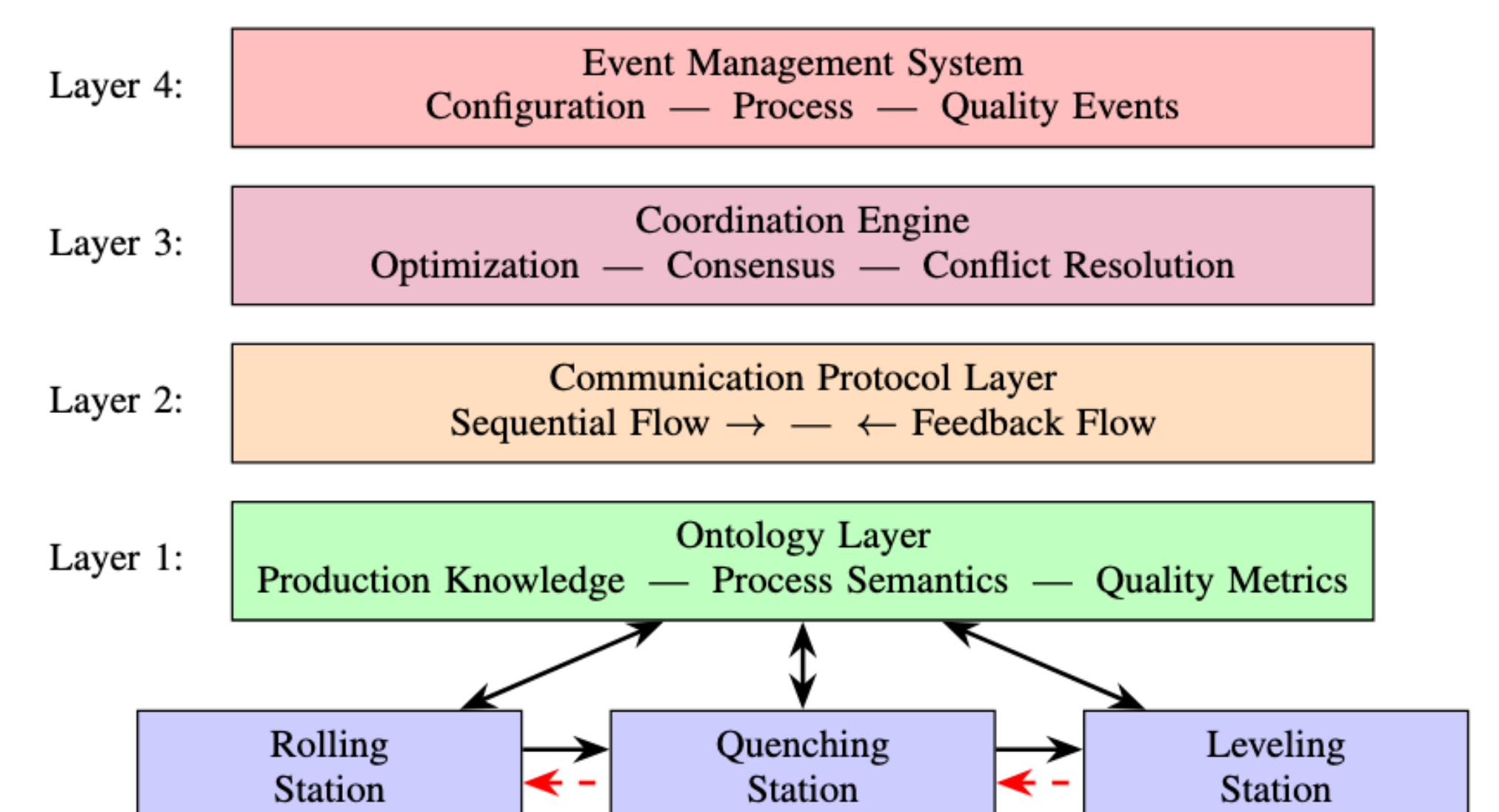
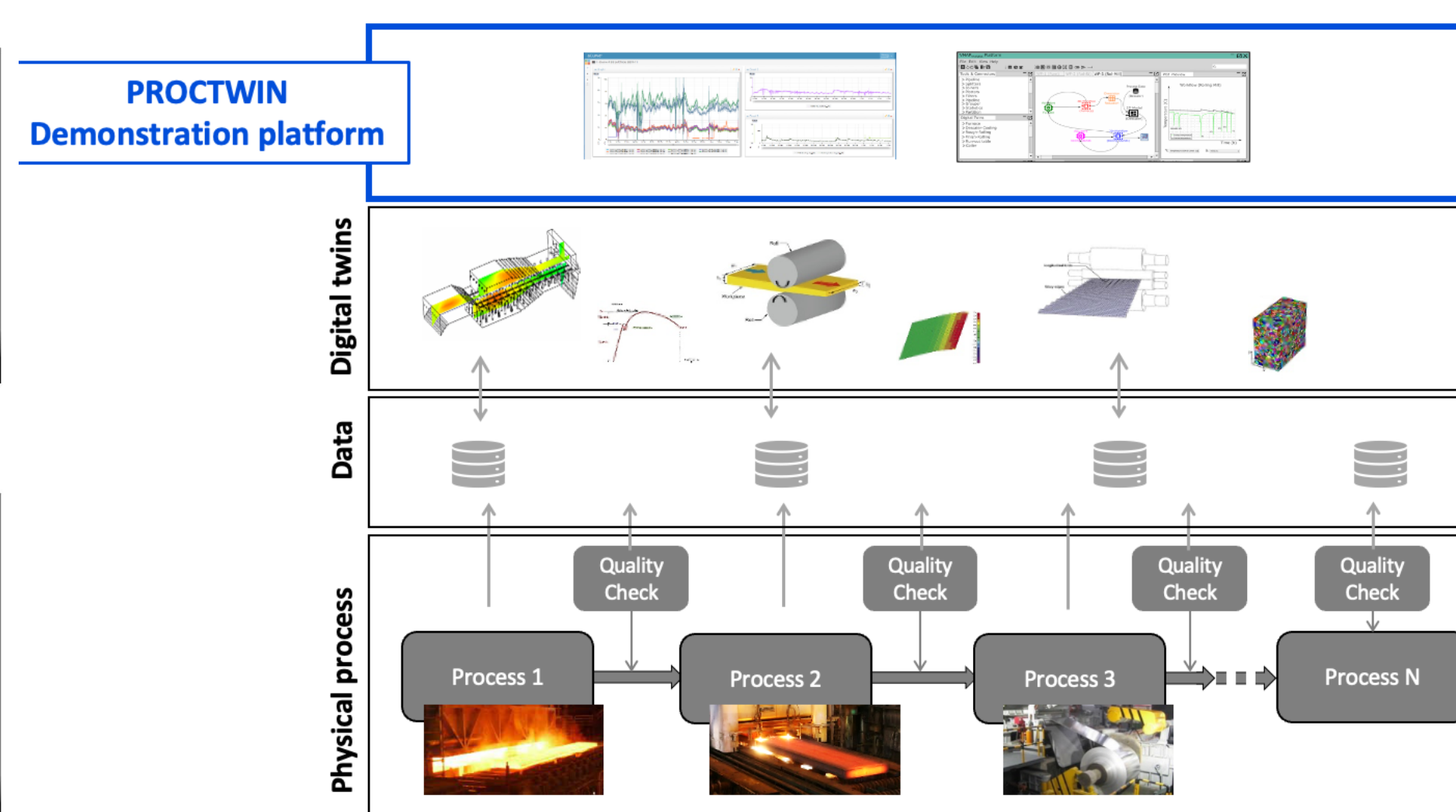
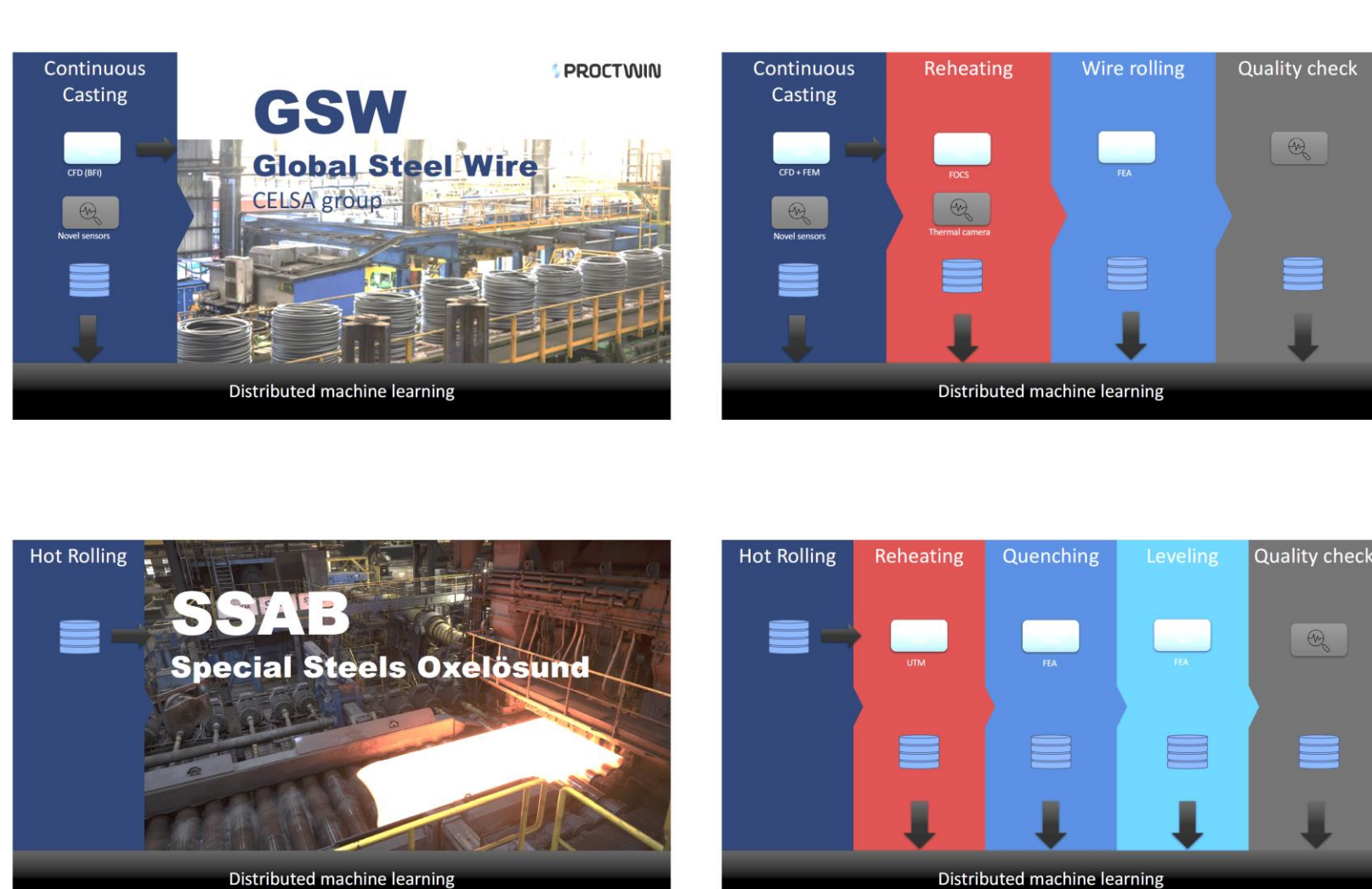
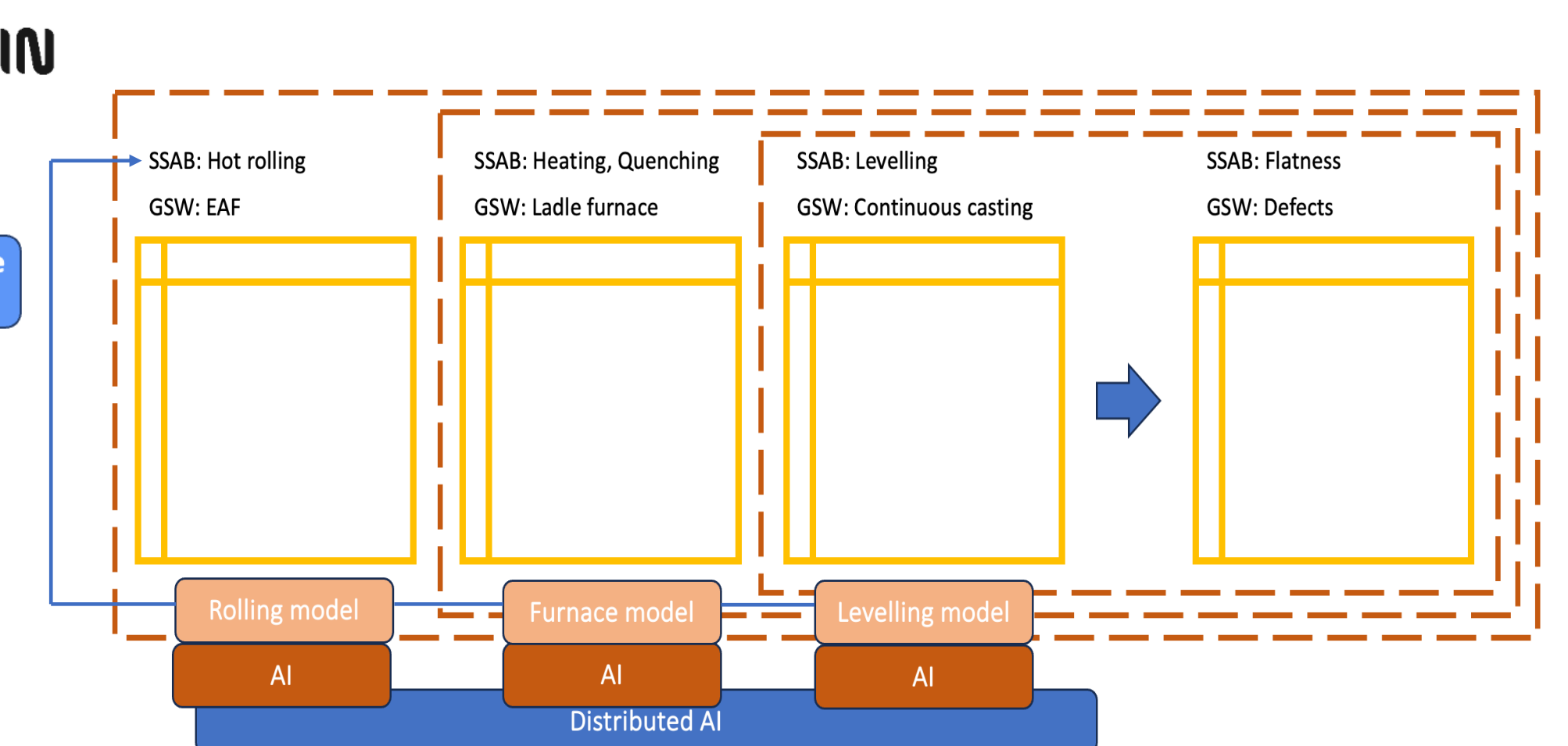


Fig. 1. Semantic-Aware Adaptive Communication Framework Architecture

### INDUSTRIAL DEMONSTRATION



#### Local model integration and collaboration of AI sub models



### EXPECTED IMPACT

ProcTwin supports the green and digital transition of the European steel industry

Real-time process monitoring and control of processes

Decision-supported planning and monitoring

Reduced failures and scrap, improve safety and CO2 reduction

Improved material-state control via novel sensors and models

Secure data sharing via a data mesh approach

Inline classification and traceability across the value chain

Greater transparency supporting customer sustainability initiatives

### CONSORTIUM



Funded by the European Union

This project has received funding from the European Union under grant agreement number 101178721. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Commission nor the granting authority can be held responsible for them.