SMART HANDLE

D4.2 SMARTHANDLE reconfigurability enablers – Final prototypes

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Revisions

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v0.4	16/06/2025	1st round of contributions	INTRA, LMS, TECNALIA, ALL
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Abstract

This document presents the technological advancements achieved in Work Package 4 (WP4) of the SMARTHANDLE project, which focuses on designing and developing tools for offline planning and real-time orchestration of handling operations. WP4 aims on deploying a comprehensive suite of solutions including part handling sequence generators using data driven techniques from CAD models, AI-driven process planning, a digital twin for simulation, and real-time digital scene reconstruction, and a robust production line controller for process orchestration and reconfiguration. These developments intend on enhancing the flexibility and efficiency of manufacturing operations, providing scalable solutions for complex industrial environments with application paradigms within the project's three use cases.

Executive summary

The developments of WP4 can enhance the efficiency and adaptability of production lines through advanced planning and orchestration tools. These enabling technologies are the outcome of the activities of 'Task 4.1: Part handling sequence generator based on CAD models,' 'Task 4.2: Feature and capability-based AI process planning,' 'Task 4.3: Production line digital twin modeling and simulation environment setup,' and 'Task 4.4: Production line controller for task execution and monitoring.'

This report outlines the main activities per task and continues by presenting each developed enabling technology. The developed final prototypes are presented in detail following a common structure where the Architecture, Methodology, Implementation and Integrated Functionality are presented.

Acronyms and Definitions

Acronym	Meaning
BSON	Binary JSON
D	Deliverable
DDS	Data Distribution Service
HRC	Human Robot Collaboration
JAX-RS	Jakarta RESTful Web Services
JSON	JavaScript Object Notation
REST	Representational State Transfer
ROS	Robot Operating System
SQL	Structured Query Language
UI	User Interface
WP	Work Package
WS	WebService