D5.2 SMARTHANDLE reasoning enablers – Final prototypes

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Revisions

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v0.2	15/06/2025	1st round of contributions	All
v0.3	16/06/2025	1st full draft release	TECNALIA
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Acronyms and definitions

Acronym	Meaning
AI	Artificial Intelligence
API	Application Programming Interface
CAD	Computer-aided Design
DMP	Dynamic Movement Primitives
DSE	Dynamic Scheduling Engine
ERP	Enterprise Resource Planning
EV	Electric Vehicle
HRC	Human-Robot Collaboration
LLM	Large Language Model
OBB	Oriented Bounding Box

OWL	Web Ontology Language
PDDL	Planning Domain Definition Language
PLO	Pallet Loading Optimization
RGB-D	Red Green Blue - Depth
ROS	Robot Operating System
UML	Unified Modelling Language

Abstract (TECNALIA)

The final versions of the reasoning enablers designed in SMARTHANDLE are presented in this deliverable. These enable the designed solutions to be optimized and obtain the best possible results in each of the pilot cases. The optimization is tackled at different levels. Lower level optimization addresses each of the individual enablers, ranging from the optimization of the perceptual pipelines using reasoning and LLMs, to the computation of optimal grasping strategies and the best robot trajectories to execute them. At a higher level, system-wide optimization is also considered as part of the work in this work package, and discussed in the last section of the deliverable, which summarizes the work in task 5.4.

Executive summary (TECNALIA)

This document contains auxiliary description to the videos demonstrating the technical results produced in Work Package 5 on AI-based performance optimization. The individual videos are structured in a directory hierarchy matching the same division of work into tasks as the work package itself. Therefore, the sections in this document also reflect the same task-oriented structure. After the introductory section, each of the sections refer to an individual task, namely T5.1 on Multi agent AI resources interconnectivity Architecture Development, T5.2 on Product based single and multi-arm motion planning, T5.3 on Learning based grasping and T5.4 on Online parameter adaptation for multi-level system reconfiguration. A short section gathering a summary of the presented material can be found as a conclusion to the document.