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HORIZON EUROPE · MANUFACTURING AS A SERVICE · GA 101177842

UniMaaS: Unified Modelling and Automated Scheduling for Manufacturing as a Service

A trusted, data-driven platform for hybrid collaborative manufacturing networks

36	17	€6.5 M	3	4
MONTHS	**PARTNERS**	**EU CONTRIBUTION**	**TECHNICAL SUITES**	**INDUSTRIAL PILOTS**
Jan 2025 – Dec 2027	from 10 countries	Horizon Europe RIA	16 platform components	4 manufacturing domains

1 Motivations & Research Questions

Manufacturing as a Service (MaaS) lets companies — especially SMEs — access manufacturing resources and supply chains on demand.

Yet MaaS networks are **hybrid and decentralised**: heterogeneous data and systems, limited trust between partners, uncertain demand and resources, and growing pressure for circular, sustainable operations.

Key platform requirements

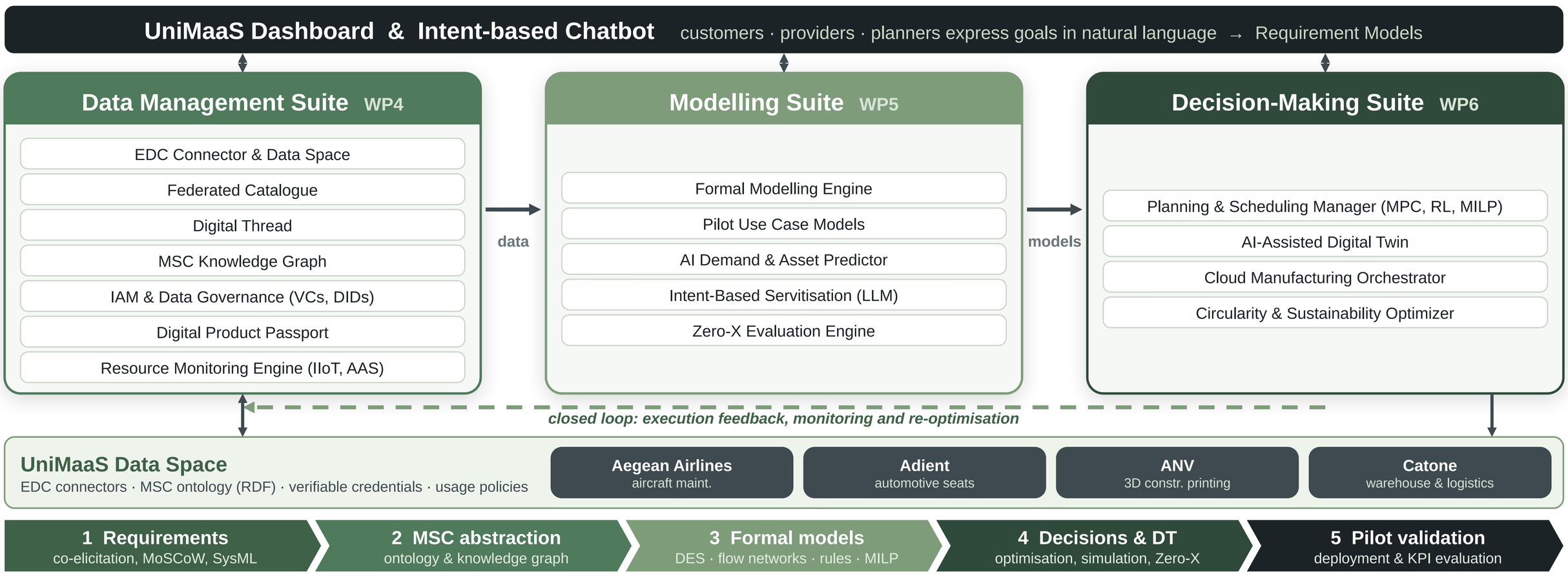
- Semantic interoperability
- Real-time resource monitoring
- Verifiable, optimised decisions
- Data sovereignty & trust
- Lifecycle traceability (DPP)
- Circularity & sustainability

RQ1 — Trust & interoperability
How can distributed manufacturing resources be described, discovered and shared in a sovereign, trusted way?

RQ2 — Intents & formal models
How can stakeholder intents be turned into formal, verifiable models of manufacturing service chains?

RQ3 — Optimised decisions
How can planning and scheduling jointly optimise cost, resilience, circularity and sustainability (Zero-X)?

2 Methodology: the UniMaaS platform architecture



3 Pilot problems & preliminary results

Pilot 1 · Aircraft maintenance — Aegean Airlines

Challenge Group maintenance tasks into heavy-maintenance projects and schedule them over multi-season horizons, balancing fleet availability, due dates and internal/external MRO capacity.

Approach Timed-arc coloured Petri nets; Q-learning on a Petri-net digital twin; formal verification of schedule feasibility.

Early result Learned policies reach higher cumulative reward than rule-based policies under stochastic conditions.

Pilot 2 · Automotive seat manufacturing — Adient

Challenge One-to-one returnable container (RTI) loops between plants cause empty trips, unbalanced stocks, high transport cost and CO_2; BOM descriptions differ across plants.

Approach Container pool as a delayed linear flow network; equilibrium-based feasibility + Model Predictive Control; transformer-based BOM classification.

Early result 8-plant Adient network: MPC significantly cuts transport cost vs. benchmark; feasibility check reduced to a linear system.

Pilot 3 · 3D construction printing — ANV

Challenge Plan and configure 3D concrete-printing orders under supplier, labour, weather and material constraints while avoiding concrete waste.

Approach AHP multi-criteria supplier selection; rule-based decision trees for order grouping, labour and printer readiness; sensor-based digital twin.

Early result Structured decision models implemented in the Planning & Scheduling Manager and digital twin of the printer.

Pilot 4 · Warehouse & logistics — Catone

Challenge Coordinate truck appointments, dock assignment and workforce shifts for temperature-sensitive goods along the cold chain.

Approach Multi-layer MILP solved iteratively (trucks → staff); DPPs for trucks and pallets; natural-language requests via the chatbot.

Early result Integrated truck–dock–workforce model formulated; first AI-prediction experiments on Catone data.

4 Key conclusions & perspectives

Conclusions

- Shared MSC ontology and data space: a trusted basis for four MaaS domains.
- Pilot formal models enable verifiable (Zero-X), optimised decisions.
- First versions of the three suites released and integrated via CI/CD.

Perspectives

- Platform integration (WP8) and pilot KPI evaluation (WP9), 2026–2027.
- Industry 5.0 objectives embedded in long-term re-optimisation.
- Hybrid collaboration: LLM intents bridging humans, AI agents and providers.

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