

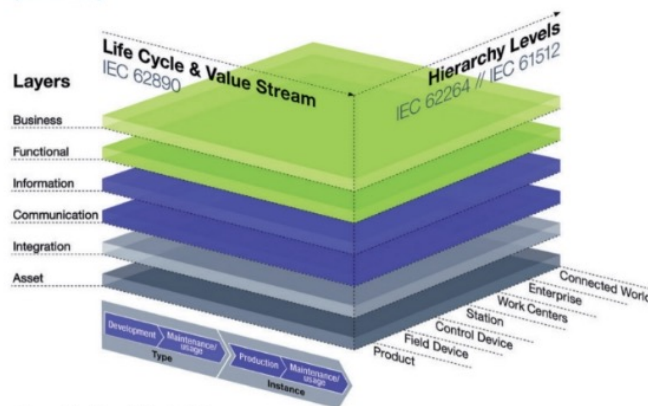
Using Asset Administration Shell for modelling and deploying Planning Agents in a Smart Factory

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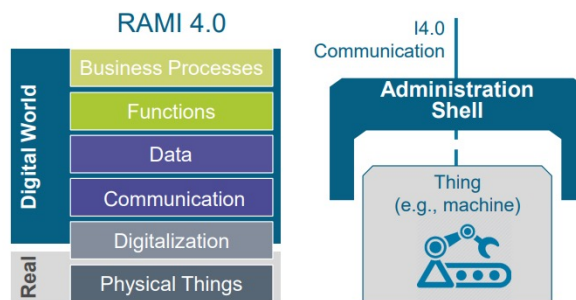
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Industry 4.0 – Assets & Agents

Reference Architectural Model Industrie 4.0 (RAMI 4.0)



Source: Plattform Industrie 4.0



- **I4.0 Ecosystem:** Assets & Agents
- **Assets:** entities of I4.0
- **Asset Administration Shell:** assets description
- **Agents:** autonomously functional digital assets
- **Multi-Agent System:** network of interactable agents

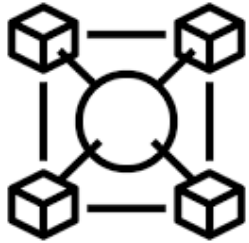
Industry 4.0 – Planning & Scheduling

- **Planning:** defines **what** and **how**
- **Scheduling:** defines **when** and **where**
- **Planning Agent:** decision-making on industrial operations in supplies, inventory, factory, logistics etc.

Needs: production information, assets interaction, multi-agent system communication



Challenges & Opportunities



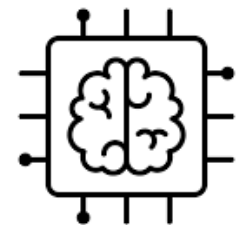
Interoperability

Standardization of information & functions within the multi-agent system



Plug-n-Play AI

Easy parametrization of algorithms

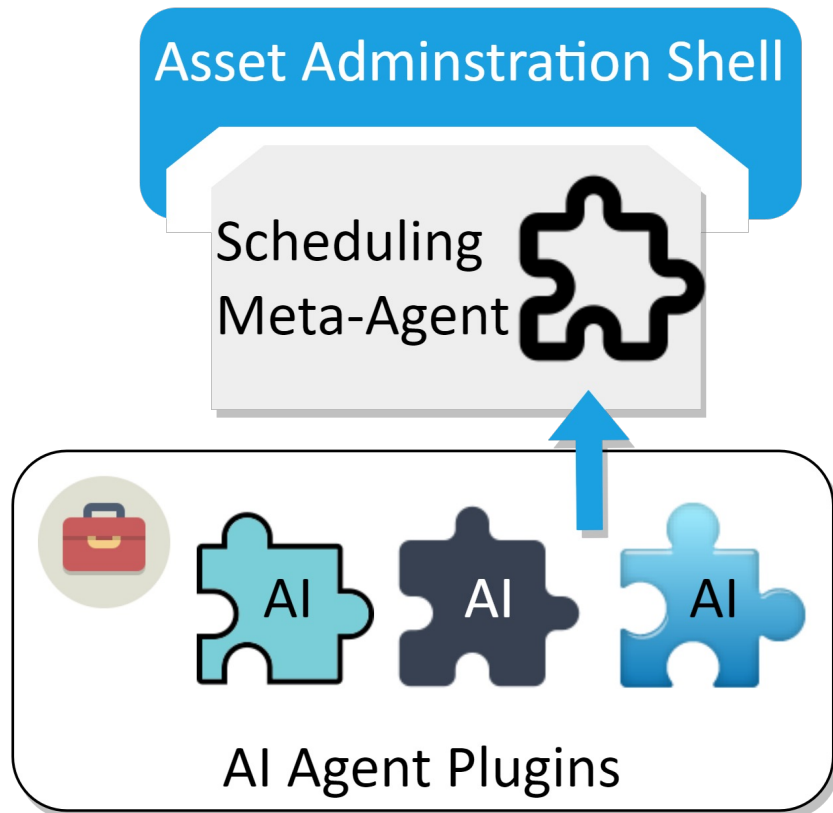


Advanced Decision-Making

Optimization capabilities in problems' variety



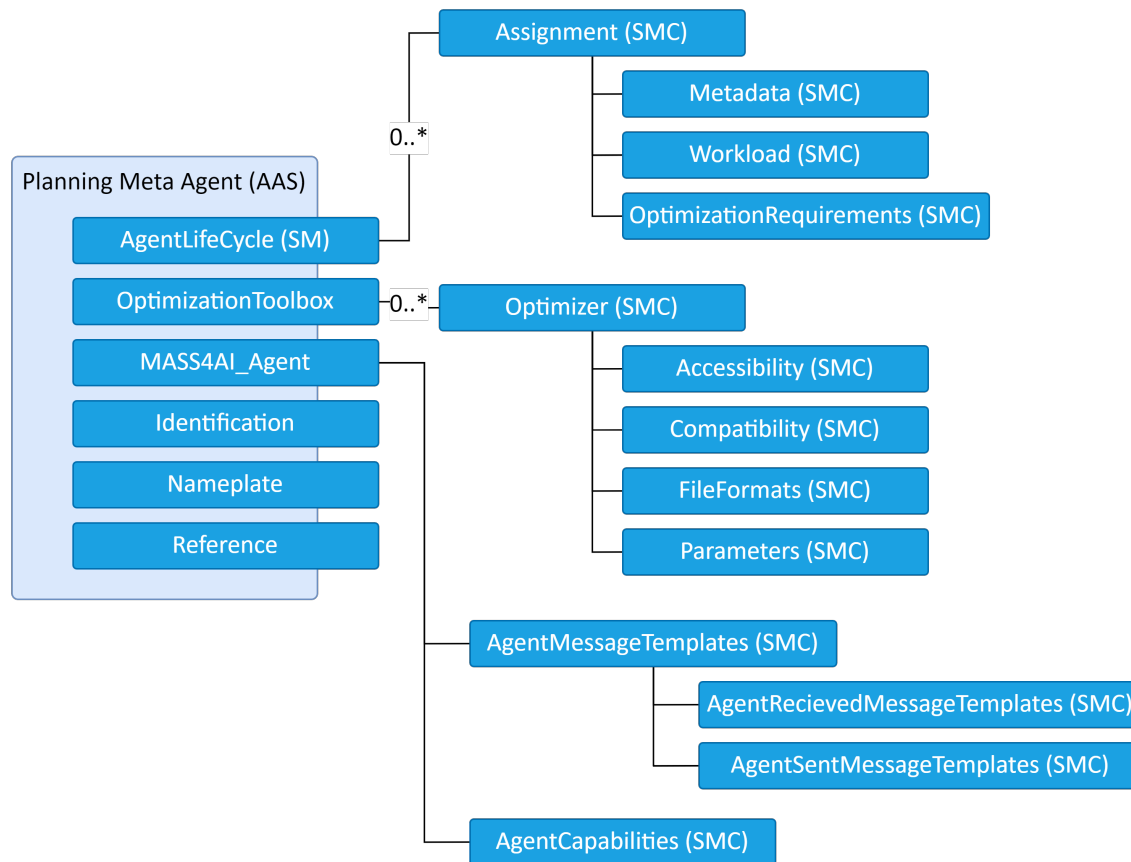
Planning Agent Architecture



Planning Agent

- **AI Toolbox**: individualized AI solutions for scheduling/ planning problems
- **AAS metamodel**: description of agent behavior, communication & data
- **MAS Integration**: interaction with other agents and systems

Planning Agent AAS – Key Submodels



Identification

Identity of the agent within the system

Lifecycle

Problems assigned during the lifespan

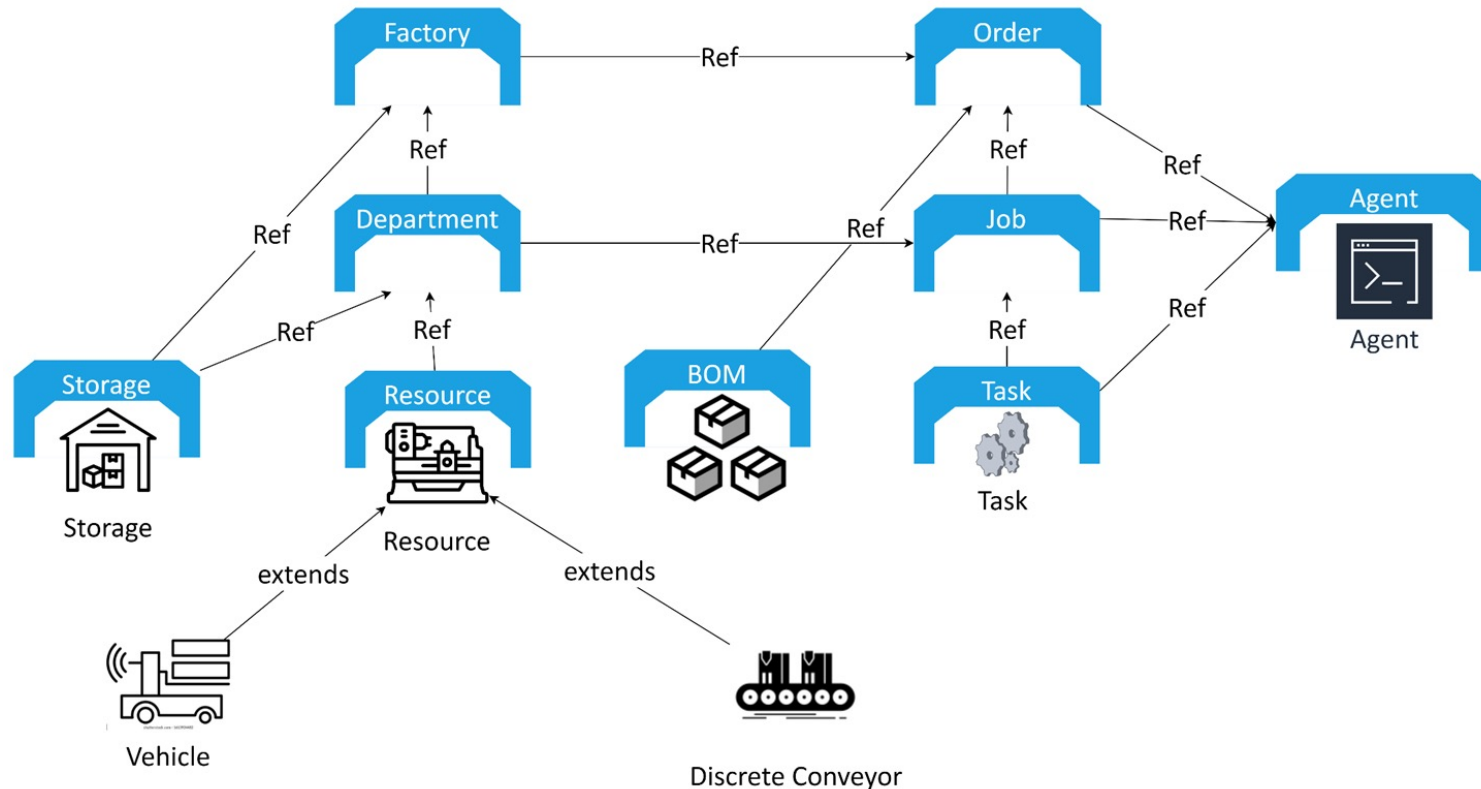
Communication & Interaction

Interactions with other agents and systems via messages or/ and AAS data

AI Toolbox

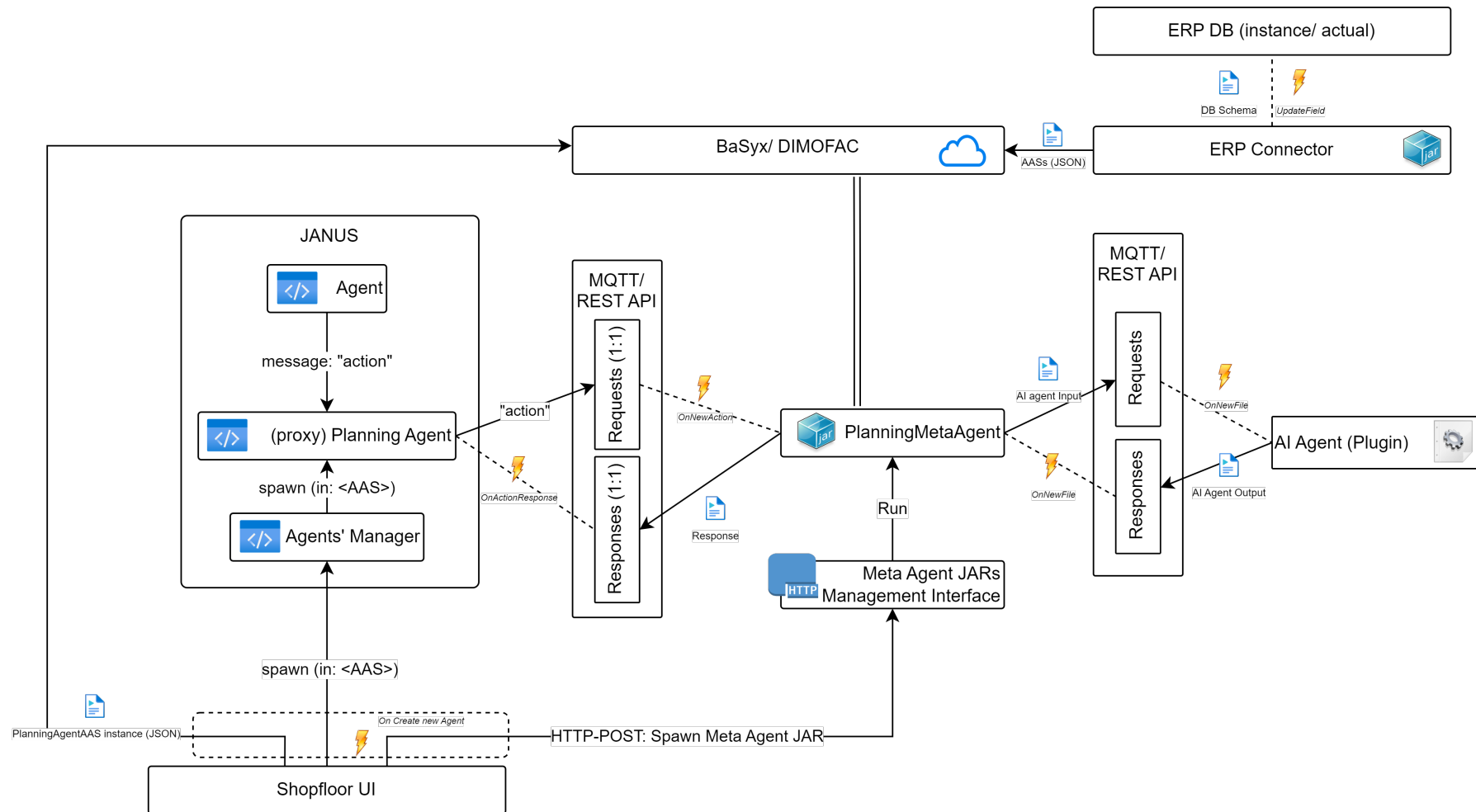
Capabilities of AI toolbox

AAS Modeling Approach



- Introduce standalone production assets related to planning with no physical or functional notion
- These assets provide modeling capabilities to all the pilot cases of MAS4AI and I/O to all the schedulers/ planners in the optimization toolbox
- The agent uses references to these assets in order to receive the input

Planning Agent Deployment



Thank you for your attention

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