



JARVIS

SECURE AND PRIVATE PRODUCTION ORCHESTRATION FOR AGILE MANUFACTURING SYSTEMS



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As markets evolve and demand greater variability, the integration of humans and robots in manufacturing becomes increasingly vital. This hybrid approach leverages the unique strengths of each: human operators contribute decision-making capabilities and natural dexterity, while robots offer mechanical advantages such as tireless heavy lifting and precise execution of repetitive tasks. By combining these strengths, manufacturers can achieve greater flexibility, efficiency, and adaptability.

However, human-robot collaboration (HRC) is not without its challenges. Key concerns include ensuring safety and minimising redundancy. The core objective of hybrid production is to assign tasks to the most suitable resource—human, robot, or machine—ensuring optimal execution. While task assignment is managed by a task planning module, effective execution requires a coordination system that expertly dispatches actions to the appropriate resources.

OPENFLOW ORCHESTRATOR (OFO)

The OpenFlow Orchestrator (OFO) plays a pivotal role in this process. Its primary function is to transform the output from the Task Planning Module (TPM) into actionable directives for each resource. OFO is responsible for dispatching these actions and ensuring smooth execution by responding dynamically to feedback from the resources. This feedback loop allows OFO to perform corrective actions when interruptions occur, as long as they don't necessitate a complete task replanning.

OFO AS THE CORE OF THE JARVIS SYSTEM

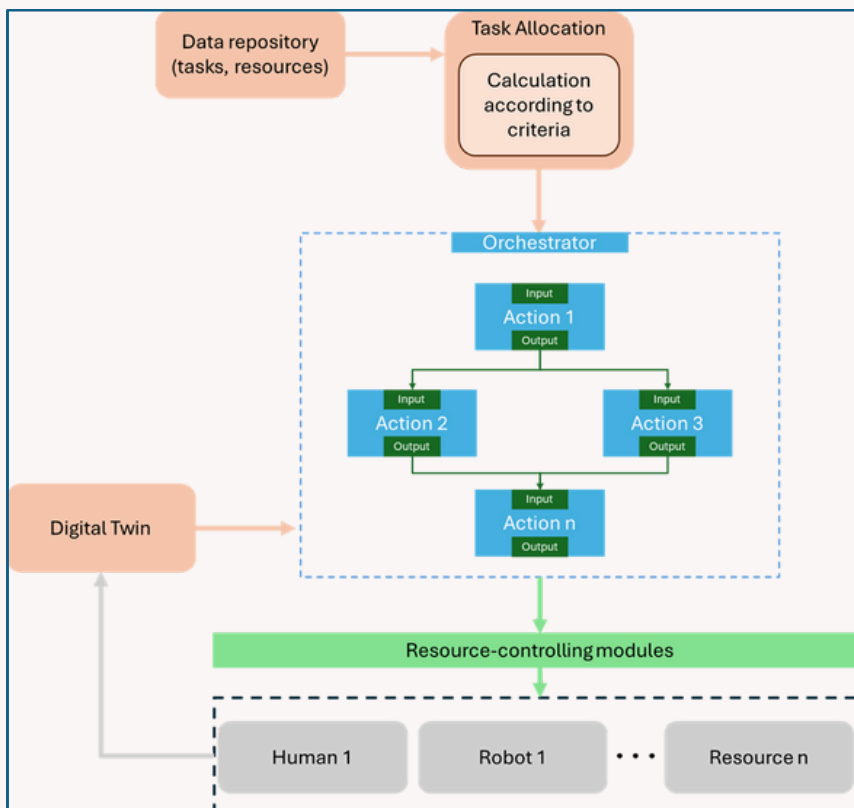
OFO is the central module of the JARVIS solution, acting as the connective tissue between various other modules. During execution, OFO manages communication between the resource-controlling modules, ensuring seamless operation. For instance, if a robot's movement requires guidance from a perception system, OFO receives detection data from the perception system and translates it into actionable targets for the robot. This dynamic propagation of information underpins the interoperability and flexibility of the JARVIS system.

COLLABORATIVE DEVELOPMENT

INTRA will lead the development of the OFO module within the context of JARVIS. This process will involve close collaboration with other module developers to define and refine communication protocols. OFO will support communication through various middleware frameworks, including ROS (the most common framework for resource communication) and other options like MQTT, depending on specific use case requirements.

USER-FRIENDLY CONTROL AND EXECUTION

Operators and production engineers will interact with OFO via intuitive, user-friendly interfaces. The orchestrator initiates the execution process by requesting the schedule from the Task Planning Module and then dispatching tasks to the designated resources. Throughout the operation, OFO monitors progress, manages resource coordination, and ensures successful execution from start to finish.



CONCLUSION

Human-robot collaboration in manufacturing offers unmatched potential to address the demands of modern production environments. The OpenFlow Orchestrator is a cornerstone of this vision, enabling efficient task coordination, seamless communication, and adaptive execution. By bridging the gap between human ingenuity and robotic efficiency, OFO exemplifies the promise of hybrid production systems in transforming manufacturing processes.