European Commission

L4MS

Logistics for Manufacturing SMEs

D1.2
OPIL architecture
version 1.0

Confidential

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I4MS

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Abstract

The deliverable is the software framework design for OPIL which is provided to start the integration of existing software components and the components developed during the early phase of the project. FIWARE Open Platform for Industry 4.0 (FWOP4I) which is an open standard and provides several de facto functionalities for Manufacturing-Automation oriented set of components and architecture has been used. Available open source components have been analysed and evaluated for logistics automation especially for AGVs regarding their ability to support interoperability and collaboration. Advanced visualisation and annotation environments, including virtual and augmented reality open source components have been considered from ROS and other open platforms in order to implement advanced collaboration environments for blue collar and white collar workers.

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History of changes

Version	Date	Author	Change
0.1 – 0.2	23/11/2017	VTT	Initial Layout and Structure
0.3	07/12/2017	ENG	Initial TOC
0.4 – 0.92	19/02/2018	ALL	Content adding and revising to all sections
0.93	19/02/2018	ENG	Draft for internal review
0.95	22/02/2018	KINE	Internal peer review finished
0.96	23/02/2018	ENG	Comments adaption
1.0	26/02/2018	VTT	Final

Glossary

Term	Description
BPO	Business Process Optimization
CEP	Complex Event Processing
CPS	Cyber-physical systems (CPS) are the basic technology platforms for IoT and IIoT and therefore the main enabler to connect physical machines that were previously disconnected. CPS is a system which links real (physical) objects and processes with information-processing (virtual) objects and processes via open, in some cases global, and constantly interconnected information networks. A CPS optionally uses services available locally or remotely, has human-machine interfaces, and offers the possibility of dynamic adaptation of the system at runtime.
FIWARE	FIWARE is an open initiative in the scope of the Future Internet PPP (FI PPP) program, aiming at the creation of a sustainable ecosystem of Cloud-ready generic components – aka Generic Enablers (GE).
GE	Generic Enablers (GE) are cloud-ready generic components that may be used as the foundational building blocks of Future Internet solutions in any area, effectively supporting the new wave of digitalization of EU industry and society. They are essentially software tools offered by FI-WARE, they are for public use and are royalty free.
HMI	Human Machine Interface
HW	Hardware
IoT	Internet of Things
IIoT	Industrial Internet of Things
Industry 4.0	Industry 4.0 is the next phase in the digitization of the manufacturing sector, driven by four disruptions: the astonishing rise in data volumes, computational power, and connectivity, especially new low-power wide-area networks; the emergence of analytics and business-intelligence capabilities; new forms of human-machine interaction such as touch interfaces and augmented-reality systems; and improvements in transferring digital instructions to the physical world, such as advanced robotics and 3-D printing. It includes cyber-physical systems, the Internet of things and cloud computing
MTP	Motion Task Planning
NGSI	Next Generation Service Interface
OPIL	Open Platform for Innovation in Logistics
ROS	Robot Operating System
SW	Software
TS	Task Supervisor

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Executive summary

The current deliverable is the outcome of the work carried on Task T1.2 and it defines the specifications for the development of OPIL, the Open Platform for Innovation in Logistics, which represents one of the main results that the L4MS project aims to achieve. The OPIL platform is defined by an architecture that has started to be outlined at proposal level and described in the DoA document. Starting from this initial design, and taking into account the end-user requirements provided as outcomes from the “D1.1 Requirements for logistics automation” deliverable – which collected and analysed them along with indications from literature sources – the definition of OPIL architecture has been revised and enriched with details which are deemed essential for the next phase, namely the OPIL integration that will be addressed by Task T1.3.

OPIL architectural design, which has been based on three different layers to logically separate the different functionalities offered by OPIL, had not to be, and it has not been started from scratch. The design has been done by seeking, analysing, and then integrating, whenever possible, the most suitable open source components able to fulfil the different purposes for which several modules have been initially identified, as depicted below.

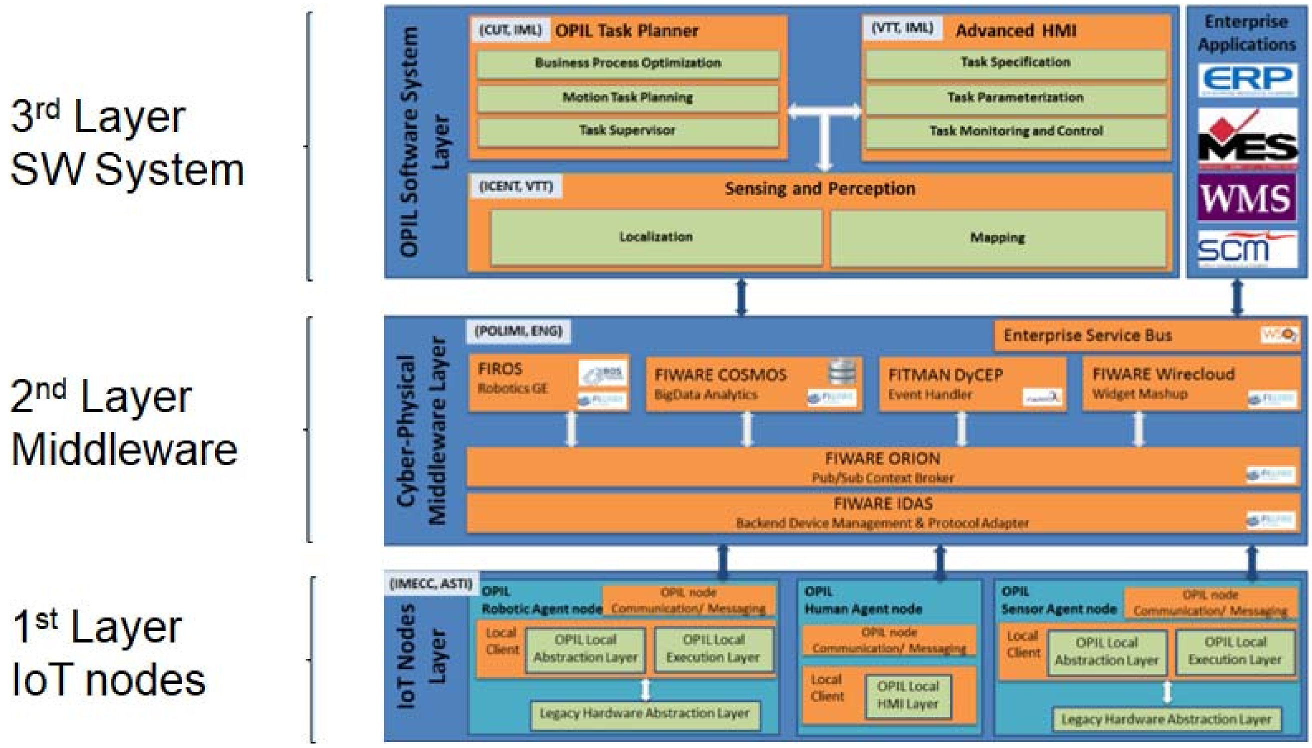

Figure 1 – Initial OPIL architecture v1.0 as from the original DoA

This document represents the bootstrap of the OPIL design & integration process which will be refined and thus updated during the project lifecycle as soon as the first feedbacks will be available from the application experiments – firstly within the pilots and then in real test-beds – where the exploitation of the OPIL platform will start to take place.

Since one of the objectives of OPIL is to allow an easy interoperability also with external systems, the platform modules will enable the integration with legacy HWs and SWs of the end-users such as, for example, on the one hand their AGVs/robots and sensors in their warehouse, and on the other hand, their enterprise applications such as ERPs, MES and so on.

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