

## Why Reference Models for Zero Defects Manufacturing

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### Some questions for you

- Do you know what are the benefits of placing your project within the problem space of a reference model?
- Do you know what are the most prominent reference models and architectures for Industry 4.0 and how do they relate to each other?
- Do you know there is an integrated reference model specifically designed to support your zero defects manufacturing use case?

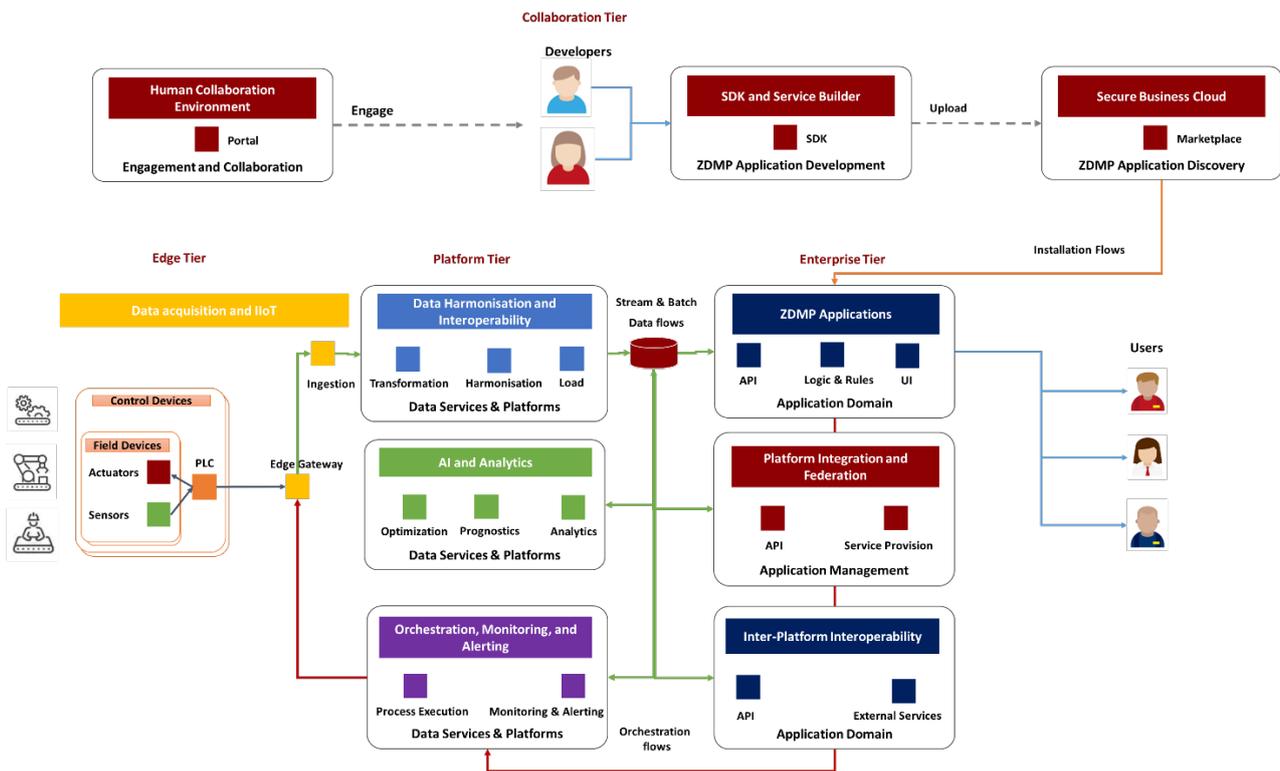
### Reference Models for Industry 4.0

The rapid advancements of Industry 4.0 related technologies (eg in fields like artificial intelligence, advanced analytics or Industrial IIoT) is driving the appearance of an ever-growing number of solutions related to digital manufacturing. In this complex landscape, reference models for Industry 4.0 - such as the Reference Architecture Model for Industry 4.0 (RAMI 4.0) [1], the Smart Manufacturing Standardization (SMS) Reference Model [2], the Intelligent Manufacturing Standardization Reference Model (IMSA) [3], and the Industrial Internet Reference Model (IIRA) [4] - provide solution-neutral reference architectural models for digital manufacturing. Even if they are normally defined at a high level of abstraction, reference models contain valuable information to address common issues in typical scenarios at different stages (definition, development, integration and operation). In short, exploring reference models provides the right orientation to implement Industry 4.0 use cases through common frameworks based on known best practices and related standards. Therefore, it is good practice to review in detail their specifications to seize these benefits. To facilitate this, the ZDMP project is developing an integrated reference model for Zero Defects Manufacturing that will guide the activities of the different stakeholders involved in the definition and implementation of new use cases and applications.

### Integrated Reference Model for Digital Manufacturing Platforms

Digital manufacturing platforms such as ZDMP, involve the cooperation of manufacturers, software developers, manufacturing equipment providers, system integrators, as well as platform system and service providers. ZDMP implements different digital services to support collaboration aspects (eg among developers, within the engagement hub or between manufacturing users and other stakeholders within the collaboration portal). The ZDMP Platform delivers open source components to implement core Industrial IoT services and supporting technologies, ranging from data acquisition, edge computing, artificial intelligence, or advanced analytics. To guide the global architecture definition of such a complex system, ZDMP uses an open, standard-based reference model for digital manufacturing platforms [5], based in leading reference models for Industry 4.0 (mainly RAMI 4.0 and IIRA). This integrated model has been defined with the support of several project partners with extensive experience in the development of Industrial IoT Systems and collaborative platforms. Acting as a group of experts they have aligned the different reference models and determine to which extent the definition they contain are complementary and applicable to the zero defects manufacturing concept. Based on this analysis, comprehensive documentation as well as general and specific recommendations have been made available to guide the architectural definition of the platform.

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## Reference Models and best practices for new use cases

AwesomeParts is an SME that has recently discovered ZDMP and they are evaluating the platform. Their IT department wants information about the overall system architecture common framework, main concepts, guidance to install a range of zero defects manufacturing applications from the marketplace and ensure that they are interoperable with their information systems in a secure way. After a successful evaluation of the installed applications, they decide to request a new application and prepare the definition and specification of the new use case in cooperation with their ZDMP developer partner Bohemian Developments. These are just some examples of different steps where the reference models support the definition and implementation of new use cases.

## What will ZDMP achieve

In general terms, the reference model provides a set of non-binding recommendations which ZDMP takes advantage of to align the architecture definition, functional specification, technical specifications and evaluation procedures to a common framework, based on a reference architecture, best practices, deployment patterns, and integration guidelines developed within the project and validated in the different pilot use case scenarios. Following these recommendations should ensure that ZDMP is interoperable and compliant with state-of-the-art systems and standards for zero defects manufacturing.

## References/Acknowledgements

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- [5] Fraile, F., Sanchis, R., Poler, R., & Ortiz, A. (2019). Reference Models for Digital Manufacturing Platforms. Applied Sciences, 9(20), 4433