Plant engineering cooperation platform

Pouria G. Bigvand,
Head of Product Management AUCOTEC AG /
Research Associate Helmut Schmidt University

Modern process and automation engineering of production plants is all about how to build up the optimal data model or digital twins of plants. Thereby, for the sake of final documentation these data models can be laid out on the 2D drawings or 3D models. Standardization trends such as ISO15926 and IEC62424 are trying to drive these data models towards certain universal standards in the definition of behaviors, classes, and attributes [1]. Such standards are typically driven vendor independent and are not describing the baseline needs of a software system architecture that can truly handle them. Additionally, trend topics such as Industry 4.0, IoT, Digital factory etc. are all the top rated topics of many scientific and industrial discussions and conferences. Nevertheless, the software platform architecture that can truly manage the complexity of a plant's digital twin is still not the main concern of respected communities. For a software platform that behaves as the container of a digital twin, topics of multi-user, multi-role, cross/multi-discipline, data-/object-centric, cloud/scalable-based IT structure, flexible data and meta model and service-based openness are considered as absolute minimum qualifications [2, 3].

In past decades, engineering and documentation of plants have gone through three major evolutions which was led by needs of design execution teams and capabilities of software vendors. First evolution was the introduction of computers, CAD tools, and methods which helped engineers to create documentation and drawings of a plant by using computers and eventually storing all the related documentation files in a centrally structured digital library. The second evolution in the documentation of plant design engineering was made through the introduction of CAE tools which provided the possibility of adding more data behind each item's representation on drawings [4]. In this technology, each item on the drawings was considered as a block that can contain some visible and invisible attributes. This evolution created significant time savings in plant design engineering by the creation of automatic spreadsheets and reports from the block objects on the drawings [5, 6].

The third evolution is the introduction of data models as the engineering backbone. This approach focused on the pure data model of a plant instead of documentation and therefore suggested a paradigm shift from document-oriented engineering to object-oriented engineering. Such paradigm shift provides significant enhancements in order to create synergy between different phases of design and to provide a real-time collaborative environment. Its advantages such as concurrent engineering, consistent documents, easier interoperability of systems, more accurate and reliable change management methods have been proven iteratively in scientific and industrial benchmarks [6].

AUCOTEC is one of the first innovative engineering software vendors that applied such technology in its new generation of product “Engineering Base” since 2008 and during past decade has made significant practical improvements towards a genuine integrated container of a plant’s digital twin. This platform not only satisfies all the minimum needs of a plant engineering cooperation environment for its full life span, it also provides the full conformity to standards such as ISO15926 and solutions such as predictive maintenance and smart execution support tools [2] based on I4.0. “Engineering Base” offers a user friendly environment for disciplines of FEED, Process and Piping, I&C, electrical, Automation [7, 8], and operation and maintenance to work on a central object-oriented system as single source of truth.

I. REFERENCES

[1] A. Fay, “ISO 15926 vs. IEC 62424 –Comparison of Plant Structure Modeling Concepts,”

[2] Pouria G. Bigvand and Alexander Fay, Eds., *Optimal path-finding in a context-aware workflow support system for process and automation Proceedings of 22nd IEEE International Conference on Emerging Technologies And Factory Automation*, 2017.

[3] P. G. Bigvand and A. Fay, Eds., *A workflow support system for the process and automation engineering of production plants*: Proceedings of 18th Annual International Conference on Industrial Technology (IEEE ICIT), Toronto, Canada, 2017.

[4] PRASHANT B. SAGAR1 and MADHUKAR R.NAGARE2, “Integration of CAD and CAE in SME's for product development,”

[5] Z. Mammeri, *Concept for interoperability between independent engineering tools of heterogeneous disciplines: Proceedings of IEEE 16th Conference on Emerging Technologies & Factory Automation (ETFA) Toulouse, France, 2011*.

[6] W. Li and W. Shen, “Collaborative engineering: From concurrent engineering to enterprise collaboration,” *Computers in Industry*, vol. 60, no. 6, pp. 365–366, 2009.

[7] P. G. Bigvand, A. Fay, R. Drath, and P. R. Carrion, Eds., *Concept and development of a semantic based data hub between process design and automation system engineering tools*. 2016 IEEE 21st International Conference on Emerging Technologies and Factory Automation (ETFA), 2016.

[8] P. G. Bigvand, A. Scholz, R. Drath, and A. Schüller, “Agile Standardization by means of PCE Requests Data Exchange via NAMUR Data Container: Proceedings of IEEE Conference on Emerging Technologies & Factory Automation ETFA, Luxembourg, Luxembourg, 2015,”