Intexc Suite – Seamless integration of model-based real-time solutions into production IT environments

The problem

- Model based applications provide an important contribution to optimised plant operations.
- It is still a challenge to integrate model-based real-time solutions with the existing heterogenous IT-systems in the plants.
- Time and effort to integrate real-time model-based applications into IT-System environments must be reduced.

The solution

- The Intexc Suite – an integration platform for real-time data orchestration of distributed model-based applications in the process industries.
- Provides a platform to realise model-based real-time solutions for monitoring, operator assistance, and online optimisation.
- Seamless model integration and orchestration of data flows with ready to use interfaces to common production IT-Systems.
- Several successful installations at industrial sites.

This project receives funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 723575.

www.spire2030.eu/copro
Intexc Suite – Seamless integration of model-based real-time solutions into production IT environments

The problem

Time and effort to bring model-based real-time solutions into industrial use

To realise industrial model-based real-time applications, it is often a challenge to integrate the developed solutions with reasonable expenditure of time and manpower into a heterogeneous industrial IT system environment. The challenge is to reduce the required time and effort to bring model-based online applications into industrial use significantly (Fig. 1). The interaction with existing production IT-Systems usually starts with the need to extract production data in order to develop and to validate models. Often the extracted data must be collected from different systems. Afterwards, the data must be pre-processed and validated (e.g. outlier detection) before it can be used. These steps are often very time consuming and need interface knowledge which is usually not a core competence of model developers. If a model has been developed and validated offline, first a prototyped installation and afterwards a sustainable integration of the model development into the existing IT system environment at the plant must be realised. Requirements of sustainability include failure detection of data communication problems, online data pre-processing and validation, and also remote monitoring and supervision of the health status. These features should be realised by a suitable integration framework.

The solution

The Intexc Suite

Within CoPro, LeiKon developed a software platform that helps to integrate model-based solutions seamlessly into a data flow orchestration environment. Within an engineering studio, function block networks can be built. These networks typically represent chains of interface blocks to read data, data validation blocks, algorithm execution blocks, and interface blocks to write the results to external systems or data storages. In order to read or write data from real-time production IT systems such as DCS, MES PIMS or ERP systems, a library of interface modules was developed. Models from different model development tools can be imported easily by using a Wizard. Using just the interface and storage modules, the Intexc Suite can be used in the first phase of the model development process to collect validated data from different production IT systems which cannot directly be imported from an existing data historian. A model-based solution that may need online connections to different IT systems within a plant, can be deployed on different runtime environments. Specific requirements of reliability and performance as well as IT security aspects can be considered. Each runtime environment includes a Web API providing a set of Web Services which can be used by external systems, e.g., by web-based HMIs to trigger model calculations or to visualise calculation results (Fig. 2).

When model-based applications are used to implement decision support systems that include IF-Then scenario evaluations, often invoking of a model-based calculation using different parameter sets in parallel is necessary. Therefore, the Intexc Suite provides a runtime environment which can handle asynchronous parallel invocations of model-based calculations.

Within CoPro, the Intexc Suite was used and evaluated by several industrial use cases and feasibility studies. With partner DIVIS, an anomaly detection application was realised at INEOS in Köln to predict decomposition events at a polyethylene plant based on a data-driven model developed with divis’ ClearVu Analytics™ toolbox. Together with partner TU Dortmund, a scheduling optimisation solution was implemented at the same site. The model was developed in the programming language Julia with the help of the modelling package JuMP and was integrated into the Intexc Suite with online data connections to several data bases. Furthermore, two additional feasibility studies were realised integrating neural network applications for decision support in the cement industry and at a grain mill.

The summary

Seamless and sustainable integration of model-based real-time applications

The Intexc Suite developed by LeiKon offers an easy to use integration platform for model-based real-time solutions. The model-based applications that have been developed using different tools and environments can be imported and connected to existing production IT systems by a flexible and modular tool suite. Within CoPro, the Intexc Suite was used in several use cases and feasibility studies to realise model-based solutions for scheduling, anomaly detection and decision support. The model-based applications were successfully realised for different scopes and user groups, by different partners with different development tools and for different data interfaces, HMI demands and IT security constraints.

The developers

Dr.-Ing. Udo Enste
LeiKon GmbH
52134 Herzogenrath
Germany
udo.enste@leikon.de

Dipl.-Inf. Jonathan Höges
LeiKon GmbH
52134 Herzogenrath
Germany
Jonathan.hoeges@leikon.de

Dr.-Ing. Felix Uecker
LeiKon GmbH
52134 Herzogenrath
Germany
felix.uecker@leikon.de

Dr.-Ing. Udo Enste
contact@leikon.de

Further information