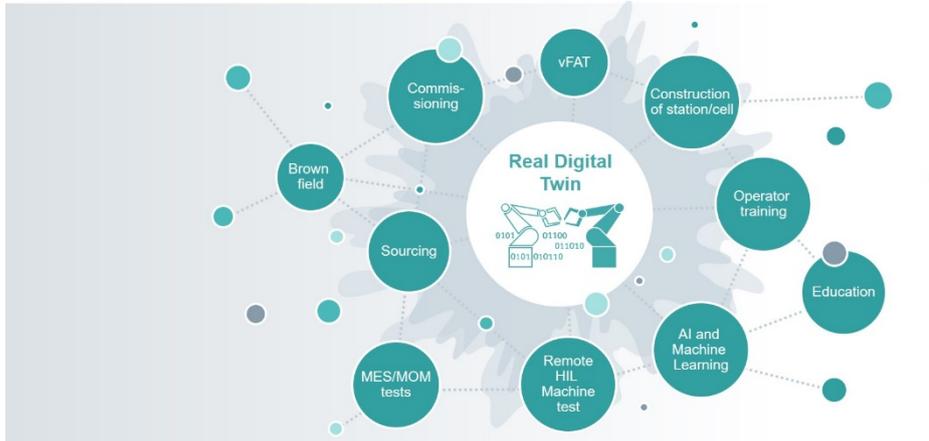# Master Thesis Project at AFRY

Title: Real Digital Twin for AI-powered Optimization

RDT is the digitalization key enabler to start the digital journey and connect to the digital thread.

AiToc is an EU project with the goal to develop an integrated tool-chain for manufacturing engineering that supports decision making from a very early phase on. There is a strong need for more efficient and effective methods for "smarter" manufacturing engineering of the future production systems.

AFRY's Real Digital Twin creates an exact digital twin of your production. By emulating plant modifications in a 100% accurate digital copy on signal level of your production environment. This results in elimination of unnecessary downtime during commissioning and ramp-up.

By combining AFRY's industry-leading real-time data handling, analysis and production capabilities with a unique Software framework, powered by Siemens, we have the ability to emulate the production cell at signal level to radically reduce down time, servicing and turn-around times for production facilities across all industries and sectors. AFRY's solution is a SW as a service that helps the customer to take next step in their digital journey with the tools of driving cost reduction and increase efficiency. The service also enables all employees to interact with the technology by training.

Whilst AFRY is on the cutting edge of digital twins with RDT, it's a fast-moving frontier. The next step is AI, connectivity and cross platform simulations.

To stay at the lead, AFRY sees a need for a sandbox RDT platform to test new automation technologies, from 3D Physics simulations tools, to AI priority decision making.

Read more at: https://afry.com/en/competence/real-digital-twin

Objective

The following thesis aims to create an emulated Real digital Twin of a production system, to use as a platform for testing automation technologies. Focus will be on scalability, reusability and exchangeability. Following subjects could be investigated:

1. FMUs
   - o Investigate possibility to use Siemens Amesim or similar for modelling of mechanical equipment and connect to SIMIT.
   - o Create FMUs to improve detail level of models and use as co-simulation or import to Siemens SIMIT.
2. AI Integration to RDT
   - o Investigate how to integrate AI to an RDT of a manufacturing cell.
3. Comparing 3D Simulation Software:
   - o Investigate strengths and weaknesses of several manufacturing simulation tools:
     - ABB RobotStudio
     - Siemens Plant Simulation
     - Siemens Process Simulate
     - Siemens NX MCD
     - Visual Components

Deliverables

One or several:
1. RDT of production system created by using FMUs or working in connection with FMUs as a co-simulation.
2. RDT of manufacturing cell made for integration with AI for decision making.
3. RDT of production system made in 3D simulation software connected to Siemens SIMIT.

Prerequisities

1. The project must be performed by two students.
2. Both students must have proven very good knowledge of PLC.
3. Both students must have knowledge and interest in programming, preferably in C, C++ or C#.
4. Interest and preferably knowledge Artificial Intelligence.

5. The thesis will be performed at AFRY.

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