



Company name	Type of document		
Volvo Group Trucks Operations	Master Thesis Description		
Name of document	Issue	Reg. No.	Page
Digital Twin modeling and simulation using FMU/FMI	01		1 (2)
Issuer (name, phone)	Sign	Date	Info class
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Background

Volvo GTO Research & Technology Development is responsible for investigations, development and demonstration of new technologies for future production methods and systems. Some of the activities and results are used in the implementation of a “Smart Factory” test and demonstration environment. This thesis work will contribute to the development of this test bed and related *Digital Twin* and simulation tools.

Description of the thesis work:

The traditional approach to creating and using simulation models is that a user need to start from creating and acquiring CAD models and create all the geometries, kinematics, functions etc. This is a very time consuming and expensive way of working, especially to make detailed / physically based models to simulate and emulate accurate behaviors. The technology called Functional Mock-up Interfaces (FMI) with Functional Mock-up Units (FMU) is a standardized approach to provide an advanced component or equipment model that can improve and speed-up the creation of system models for simulation of a “Digital Twin”. The task for the master thesis work is to develop a solution using these technologies for a portal robot system in the “Smart Factory test bed – See figure 1. The assignment of this thesis includes:

- Development of FMU / FMI architecture for the test bed equipment and the application
- Development of identified FMUs with the proper kinematics and dynamic physical behavior, as well as control logic and behavior.
- Development of test and demonstration application (Simulation and programming).
- Evaluation of efficiency and quality potential in using FMU/FMI technology compared to conventional modelling and simulation.
- Building the test and demo set-up and integration of the digital / physical system.
- Demonstration, dissemination and training some Volvo employees.

The goal is that the thesis work can demonstrate a co-simulation model, based on the FMU/FMI technology, which can simulate and validate the physical implementation of the equipment and evaluate how exact the Digital Twin replica can be.

- **Education:** Relevant Master Programs: "Systems, Control and Mechatronics, MSc", "Production Engineering, MSc" and "Product Development, MSc".
(The Master Thesis work will be done in close collaboration with / supervised from the institution "Electrical Engineering" and the research group Automation at Chalmers)



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- **Language:** English
- **Number of students:** Two (2)
- **Application due date:** 2020-11-15
- **Start date:** 2020-01-18 (or later)
- **Location:** Volvo GTO, Lundby, Gothenburg
- **Supervisor:** Johan Vallhagen, R&TD Digital Operations, 031- 323 61 71

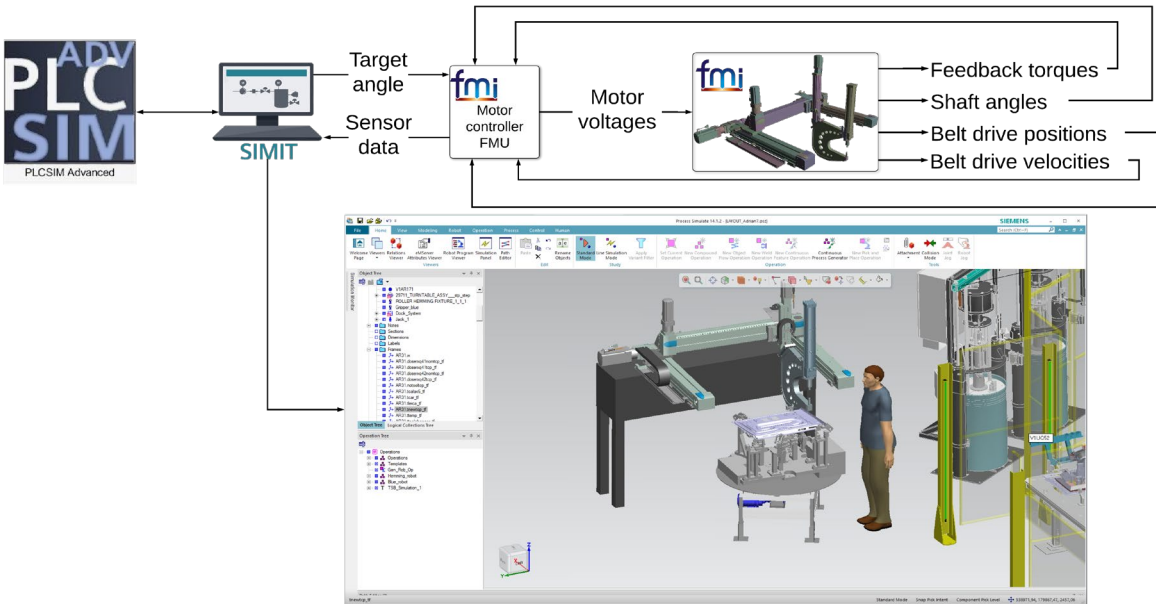


Figure 1. Illustration of a portal robot and a concept for the FMU/FMI simulation set-up.

About us

The Volvo Group is one of the world’s leading manufacturers of trucks, buses, construction equipment and marine and industrial engines under the leading brands Volvo, Renault Trucks, Mack, UD Trucks, Eicher, SDLG, Terex Trucks, Prevost, Nova Bus, UD Bus and Volvo Penta. **Volvo Group Trucks Operations** encompasses all production of the Group’s engines and transmissions, as well as all production of Volvo, Renault and Mack trucks. The organization is responsible for spare parts supplies to the Group’s customers as well as for designing, operating and optimizing logistics and supply chain for all brands, production facilities and distribution centers where the Volvo Group operates. In Volvo Group Trucks Operations you will be part of a diverse team of highly skilled professionals who work with passion, trust and embrace change to stay ahead. We make our customers win.

The thesis work will be available on Volvo Group career website:
<https://www.volvogroup.com/en-en/careers/job-listing.html?deeplink=true&contracts=Thesis>