SCHAEFFLER



Model-Based Design of Mechatronic Systems

Ing. Milan Kertész, PhD. Ing. Jozef Sakson

Technical Computing Camp Brno 2021

- **1** Technological Transition of Schaeffler
- 2 Mechatronic Development in Schaeffler
- **3** Mechatronic Powertrain Systems
- 4 Model-Based Design in System Development
- 5 Model-Based Design in Software Development

Model-Based Design of Mechatronic Systems

Technological Transition of Schaeffler

Technological transition of Schaeffler portfolio can be described in three dimensions:

- 1. Simple to Complex products
- 2. Mechanical to Mechatronic products
- 3. Components to Systems





Model-Based Design of Mechatronic Systems

Mechatronic Development in Schaeffler

V-Cycle as a spine of systems development



SCHAEFFLER

Mechatronic Powertrain Systems

Several elements of vehicles are within the interest of our development in Schaeffler:

- Chassis
- Engines
- Transmissions
- Electric drives



SCHAEFFLER

SCHAEFFLER

Model-Based Design in System Development



The aim is to create a mathematical model of a mechatronic system that allows us to design complex control algorithms with a prediction for:

- Electric motors
- Power electronics
- Clutches
- Cooling systems
- Electro-hydraulic actuators
- Electro-mechanical actuators etc.

Domain-wise, various effects have to treated:

- Mechanical wear
- Thermal influence
- Hydraulic effects etc.

Model-Based Design in Software Development

Finally, a robust control algorithm based on analytical knowledge of the system have to be implemented to the brain of the system – the controller Appropriate model simplification have to be made – because of the hardware limitations Simulink model code generation is used to produce the C code for the specific controller

Related xIL tests as a part of the IV&V



two wheels NGT atomic (ww.friggerodFastSubsystem_PREV_T = two wheels NGT atomic // >Fiming.clockSick2;

TriggeredFustSubsystem_ELAPS_F

TriggeredFastSubsystem_ELAPS_T

192

tas yénels NAF_atomic Dék TriggerüdfastSüösystem RESET_EL = falses /* Scientra Entragrator: <u>(Siy)Macrute Fier Entragrator</u> SVSTES = = 93 { ff (Lag.yénels: NAT atomic De Déservestina Entragrator SVSTES = = 93 { toxy yénels: DAT atomic De Déservestina Entragrator SVSTES = = 83 48 * (real_3)

* twp_yheels_SHT_start(_SHLStscrateNineIntegrator_PHEF_SF_ }
/* Did of OlscrateIntegrator: 'sSt2/Discrate-Dime_Integrator' */
/* DiscrateIntegrator: 'sSt2/Discrate-Dime_Integrator' */
/* OlscrateStScrateStart(_SHLStscrateStart() */
44 (twp_sheels_SHLstscrateStart() */
44 (twp_sheels_SHLstscrateStart())
54 (twp_sheels_SHLstsc

* Suggenets yet analy yet, yet, by Storeter Unitary and a set yet yet yet and a set of storeter integratory of the set of storeter integratory of the set of storeter integratory of the set of the







Thank You!