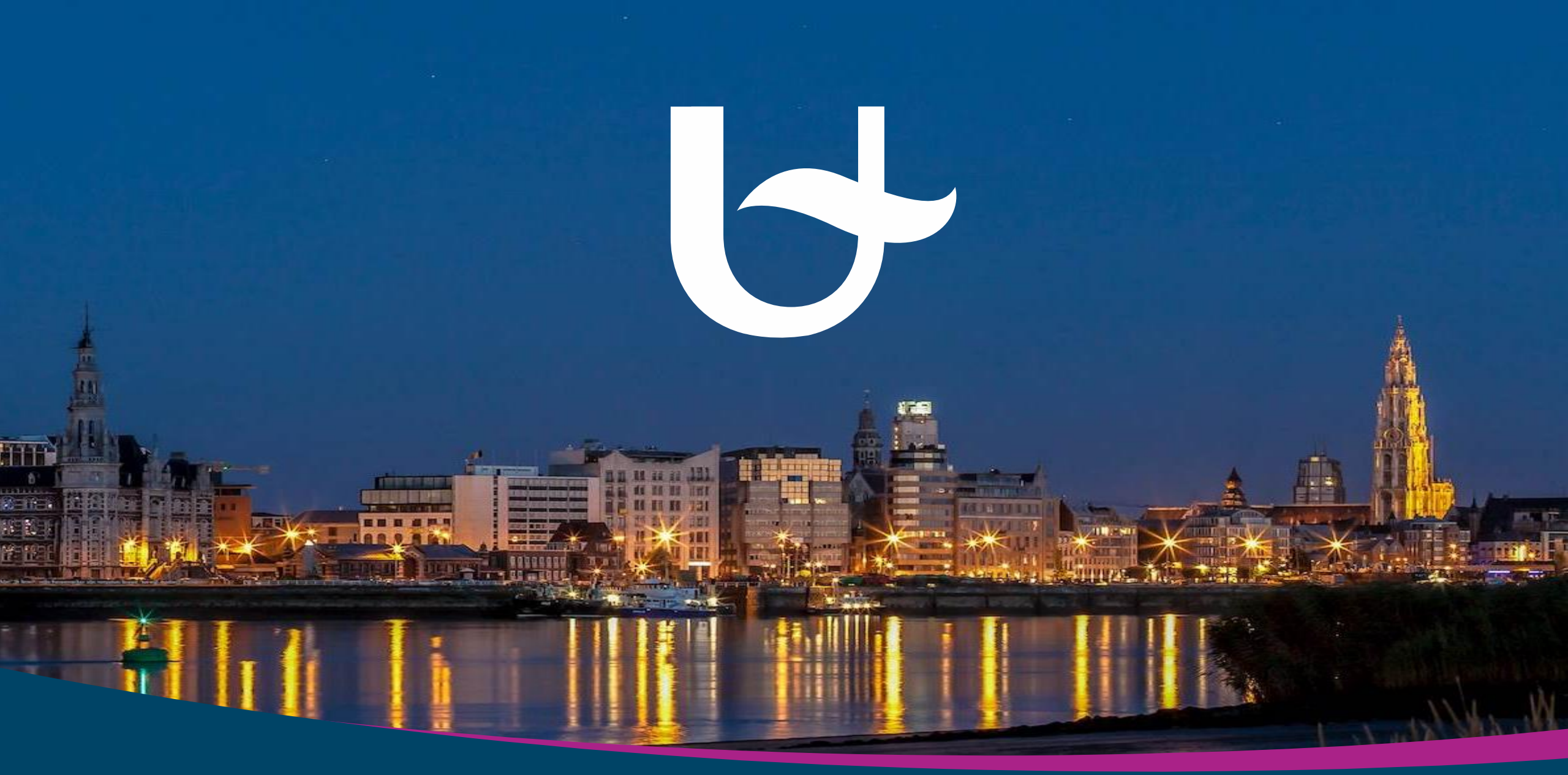


CoSys-Lab
Constrained Systems Lab
University of Antwerp

19/12/2018

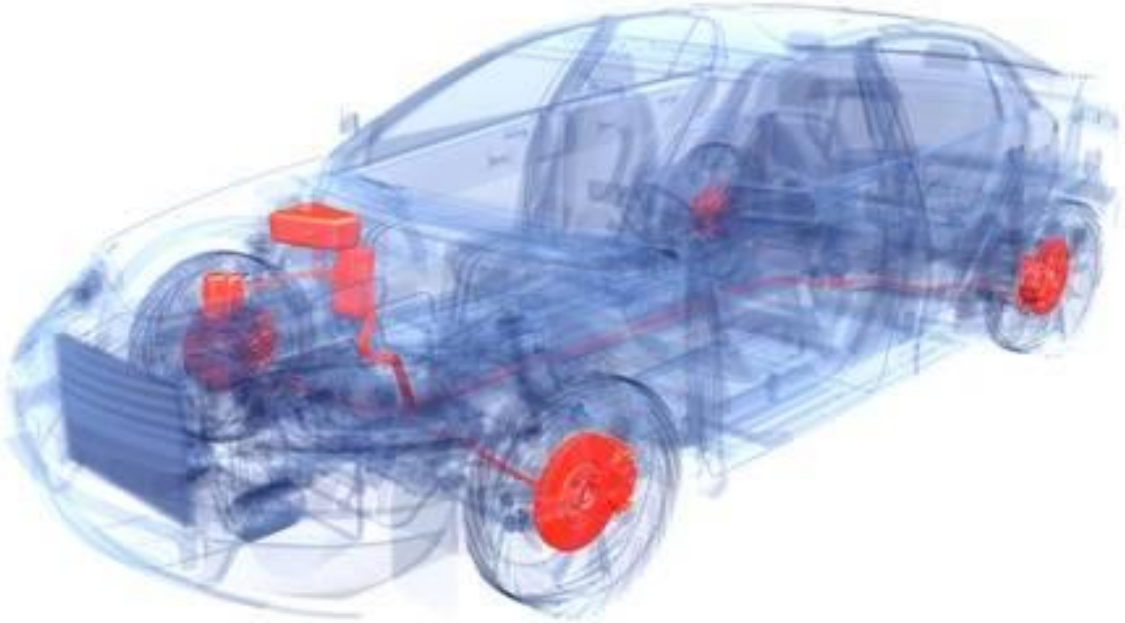
Valid deployment of Models-of-the-physics using Validity Frames

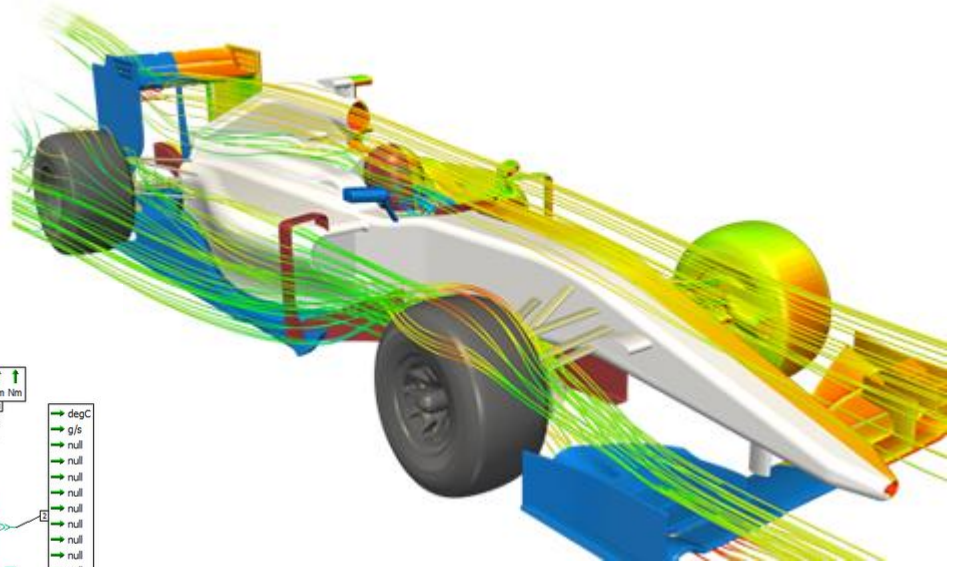
Bert Van Acker

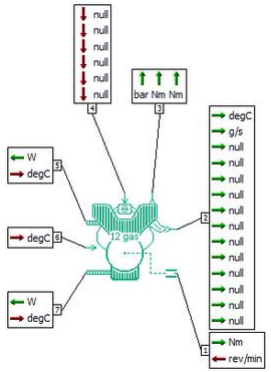
CoSys-Lab
Constrained Systems Lab
University of Antwerp

Pushing the boundaries of Cyber-physical systems

Why?(What is the need)

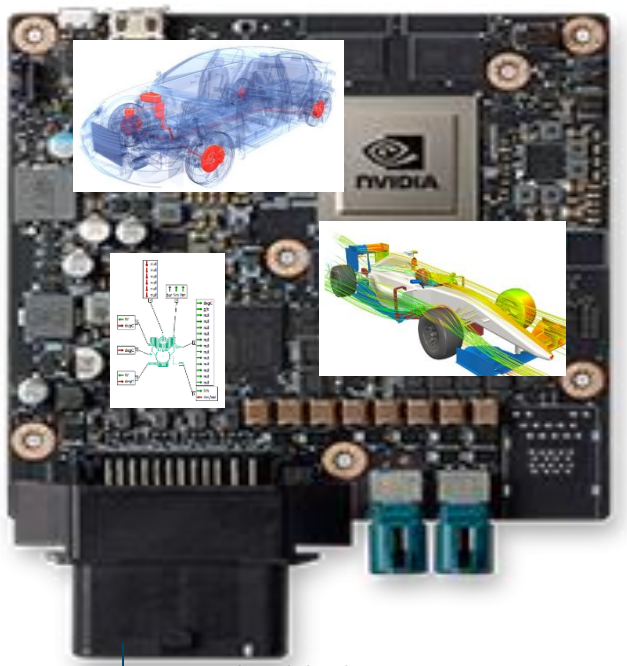






Embedded target

Why?(What is the need)



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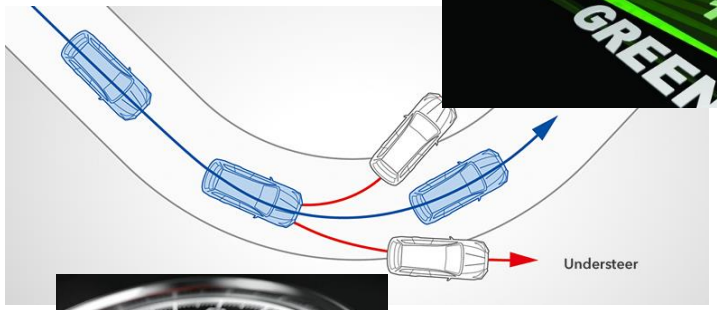
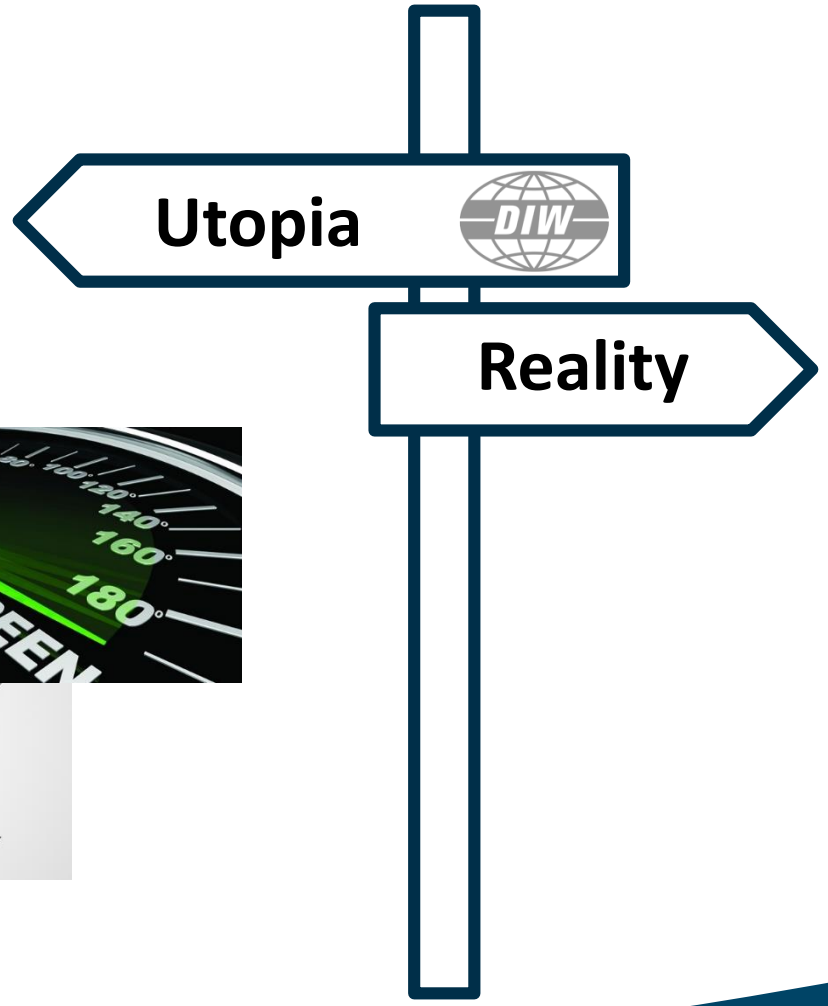
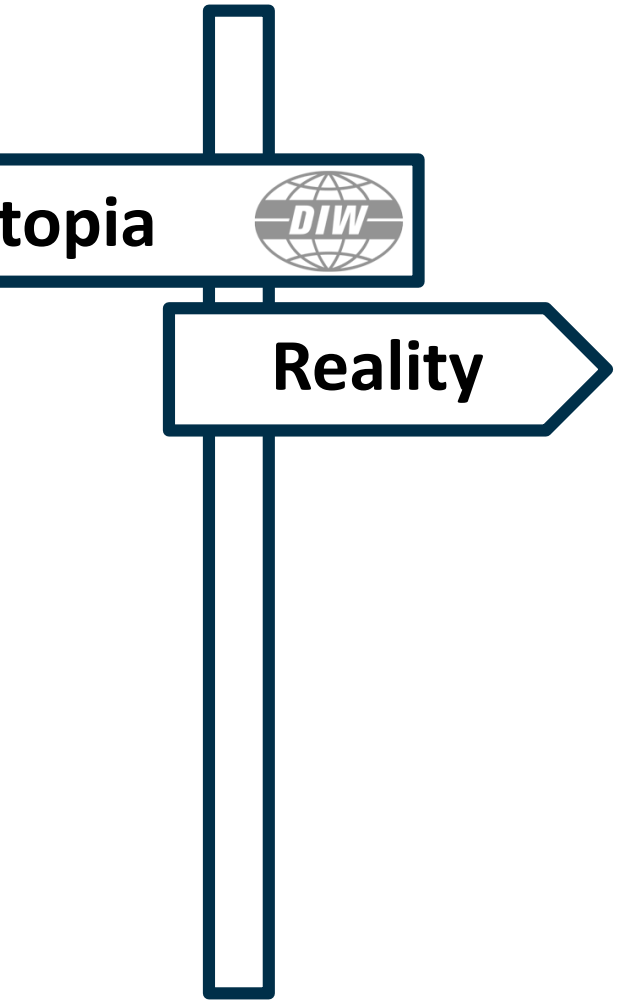
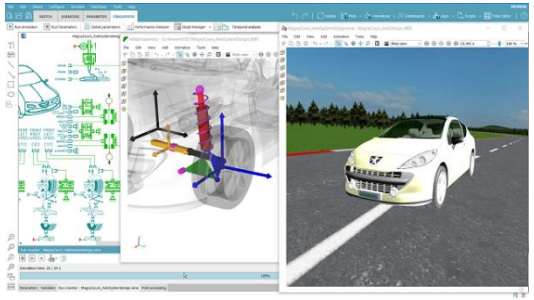




Why?(What is the need)



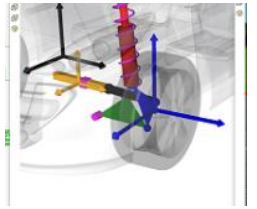


High-fidelity model

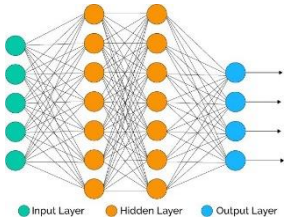
Reductions/approximations

$$m_1\ddot{x}_1 = -b_1\dot{x}_1 - k_1x_1 + k_2(x_2 - x_1)$$
$$m_2\ddot{x}_2 = -k_2(x_2 - x_1) + k_3(y - x_2) - b_2\dot{x}_2$$

or



or



Or …

Constraint system

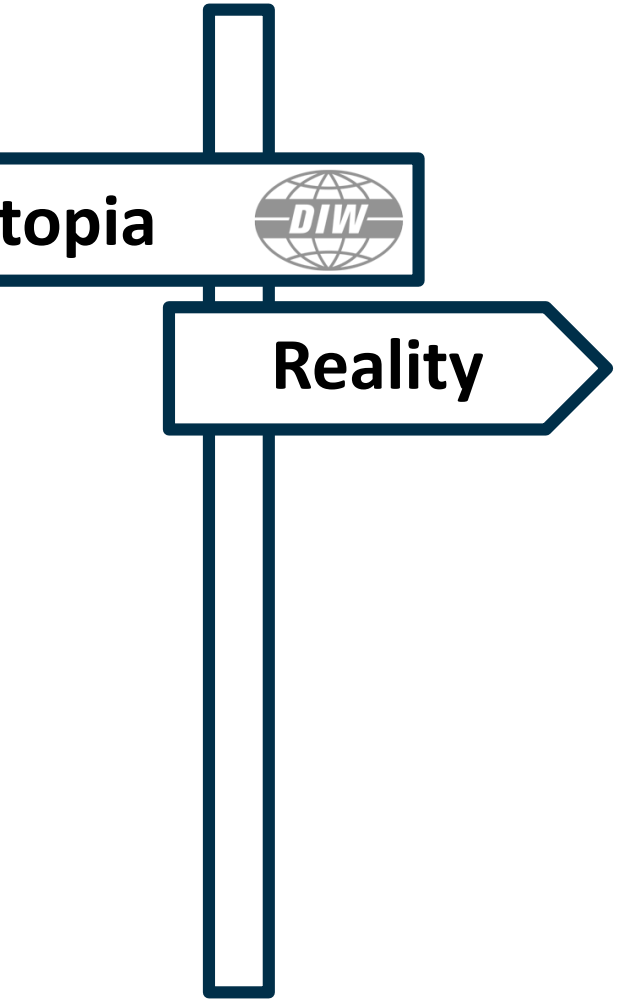
-> [MEM_{min},MEM_{max}]

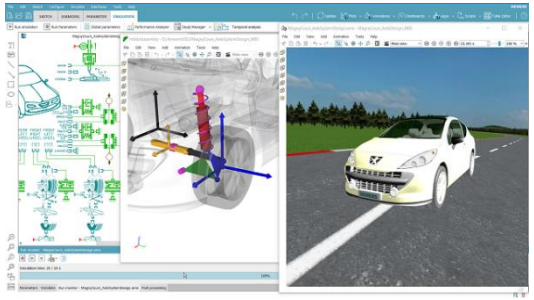
-> [$COMP_{min}$,$COMP_{max}$]

-> Hard real-time!

-> …

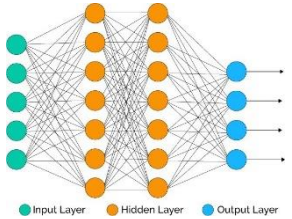
Why?(What is the need)





High-fidelity model

Reductions/approximations



Discretization/fixed-pointing/…

Constraint system

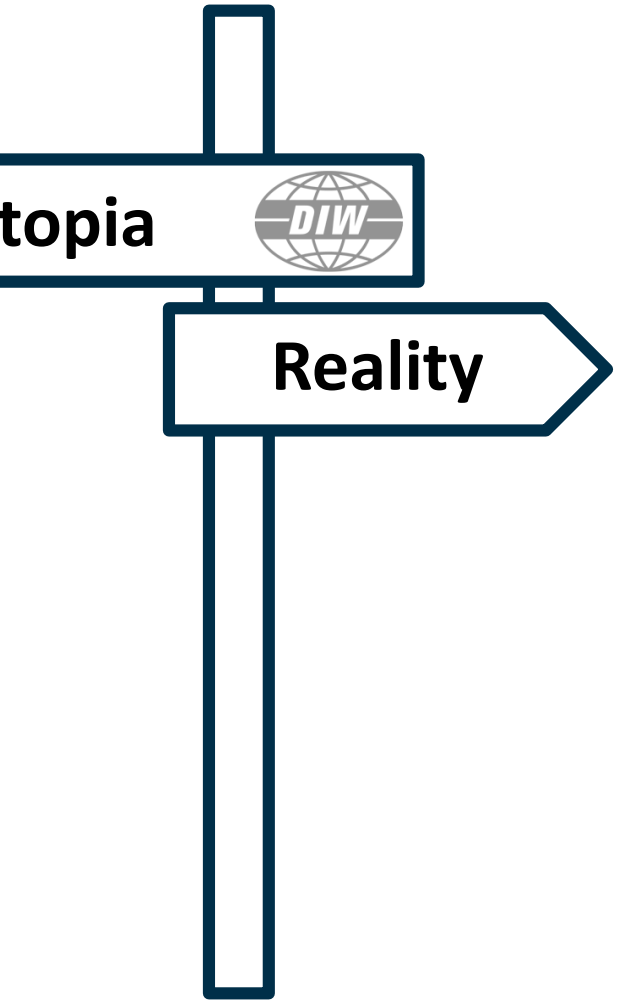
-> [MEM_{min},MEM_{max}]

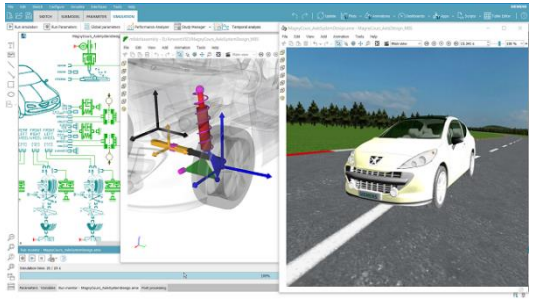
-> [$COMP_{min}$,$COMP_{max}$]

-> Hard real-time!

-> …

Why?(What is the need)

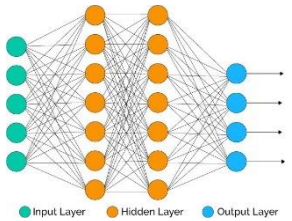




High-fidelity model

Properties?
Valid range?
Verify?

Reductions/approximations



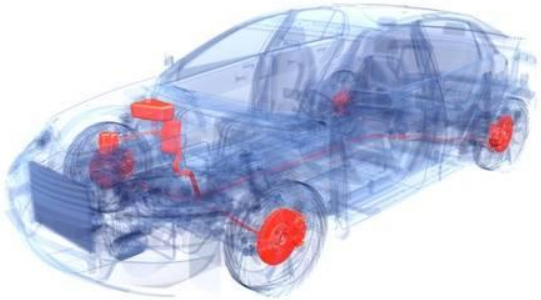
Discretization/fixed-pointing/…

Properties?
Valid range?
Verify?

Constraint system

-> [MEM_{min},MEM_{max}]
-> [$COMP_{min}$,$COMP_{max}$]
-> Hard real-time!
-> …

What? (oplossing)



…

Properties

Optimizer

Accuracy

Interface

Calibration

Model-of-the physics

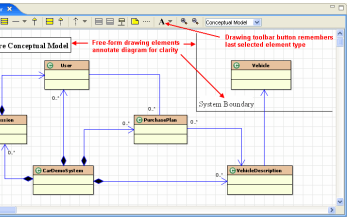
Reductions

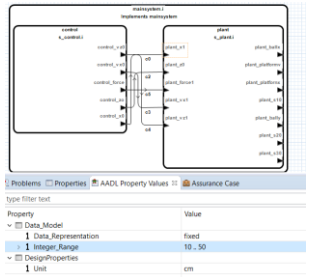
Solver

…

WCET

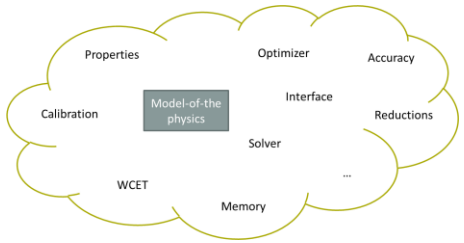
Memory





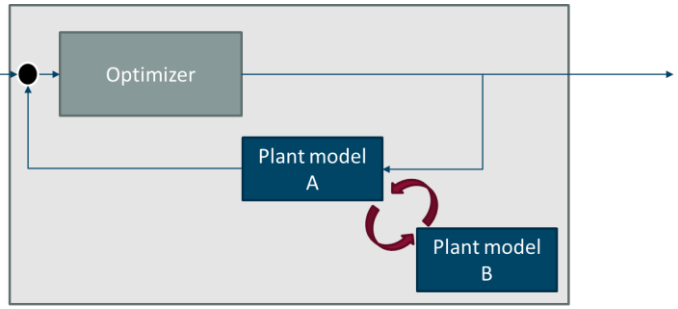
Capture

Validity frame



Verify

Usage

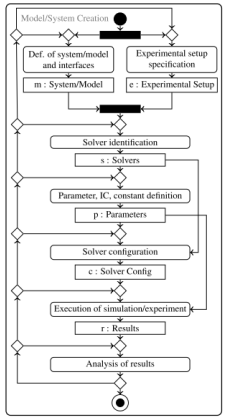


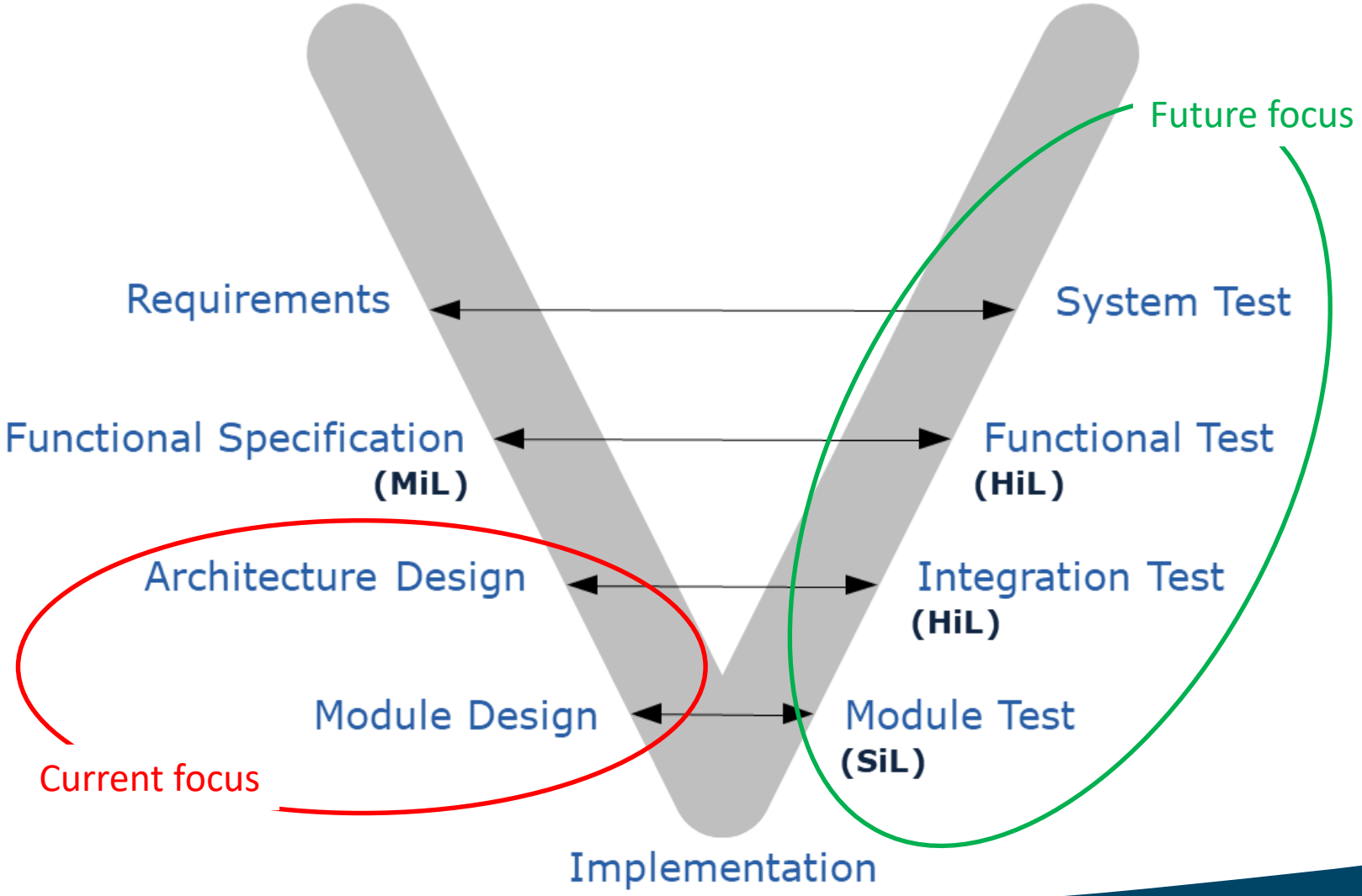
Adaptive real-time control systems

Calibration processes

Experimenter processes

Integration processes



Component (re-)usability

Roadmap (evolution 5j.)