Evolution of Landing and Arresting Gear Simulation at Fokker Landing Gear

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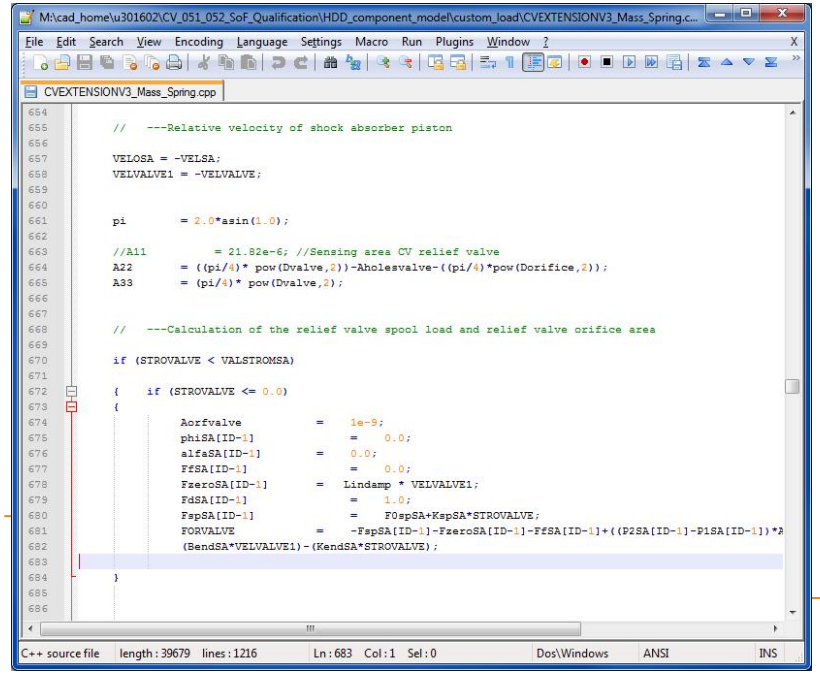
See also: Siemens, Vienna, 2016, Design optimization of Landing Gear by Matlab driven VL-Motion models

AMESIM 1D HYDRAULICS/PNEUMATICS/...

Mathematical ß modelling à **Physical**

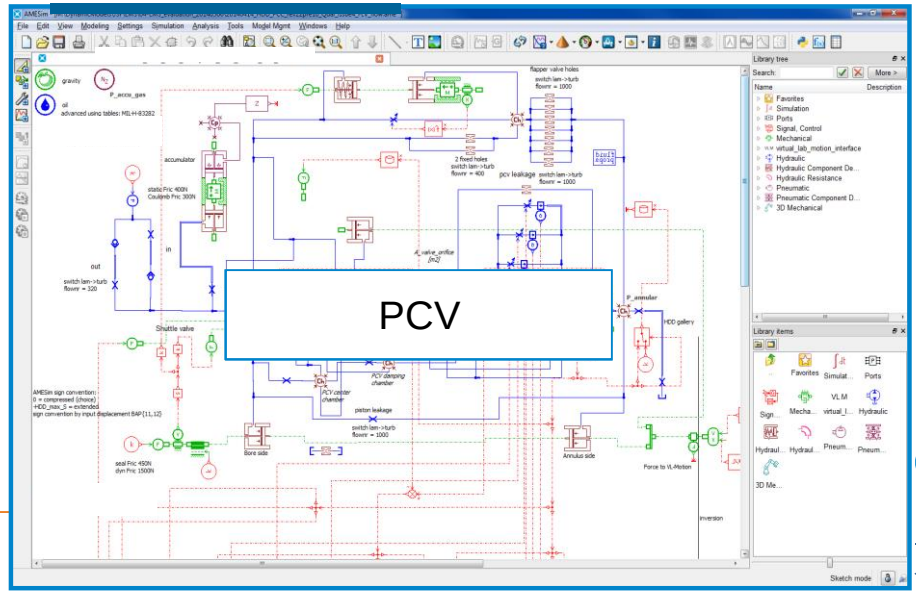
Past:

- § Free-body diagram à C-code
- § Tedious, error-prone, hard to evolve & to transfer the accumulated knowledge



Present:

- § GUI physical modelling
- § Software report in HTML
- § Easy, reliable, use of expert libs, easy model evolution & transfer of knowledge
- § FMU export



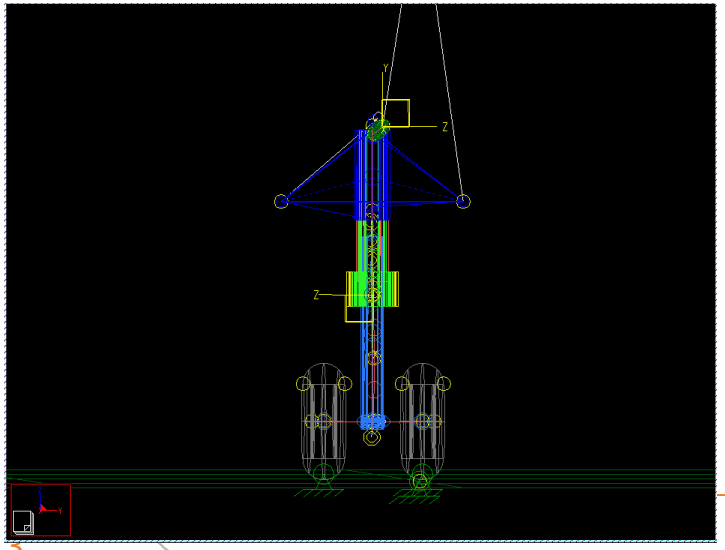
VL-MOTION 3D MULTI-BODY DYNAMICS
Flexibility options (Rigid / Beams / Modally Reduced)

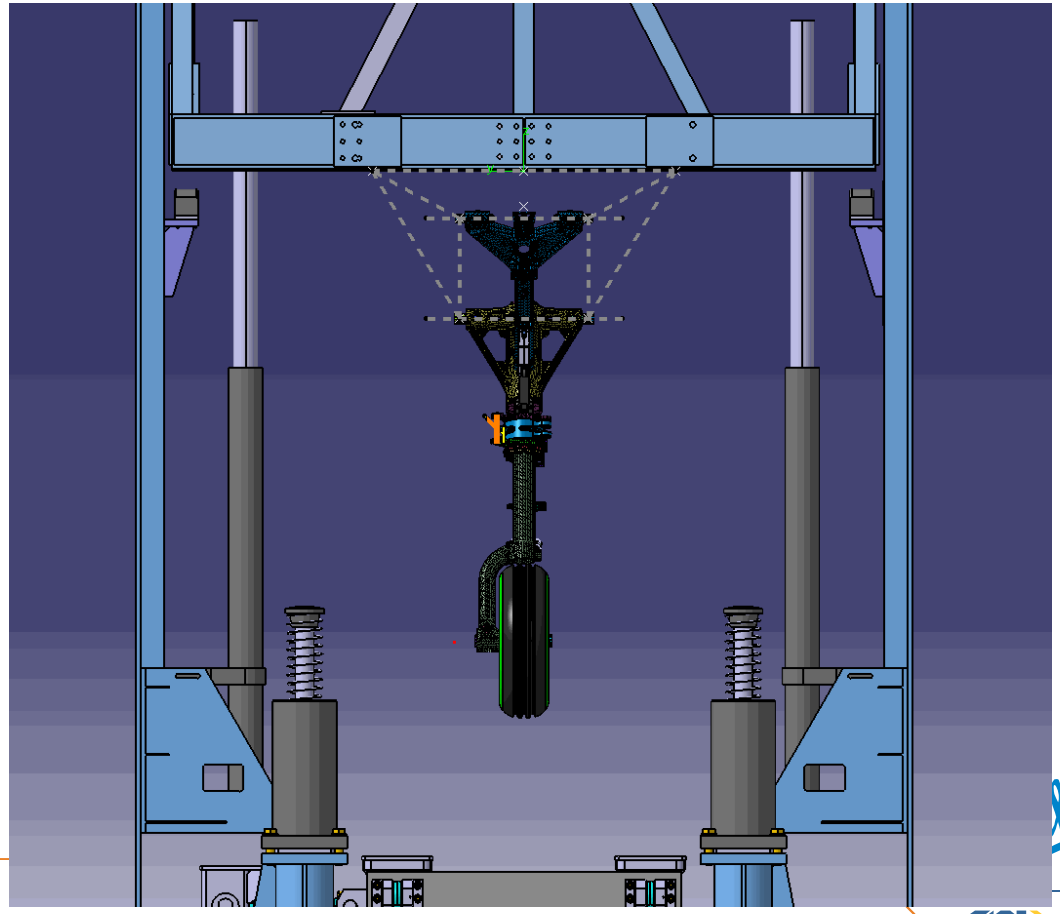
Past:

§ Flexibility via beam models

§ Coupling 1D via compilation

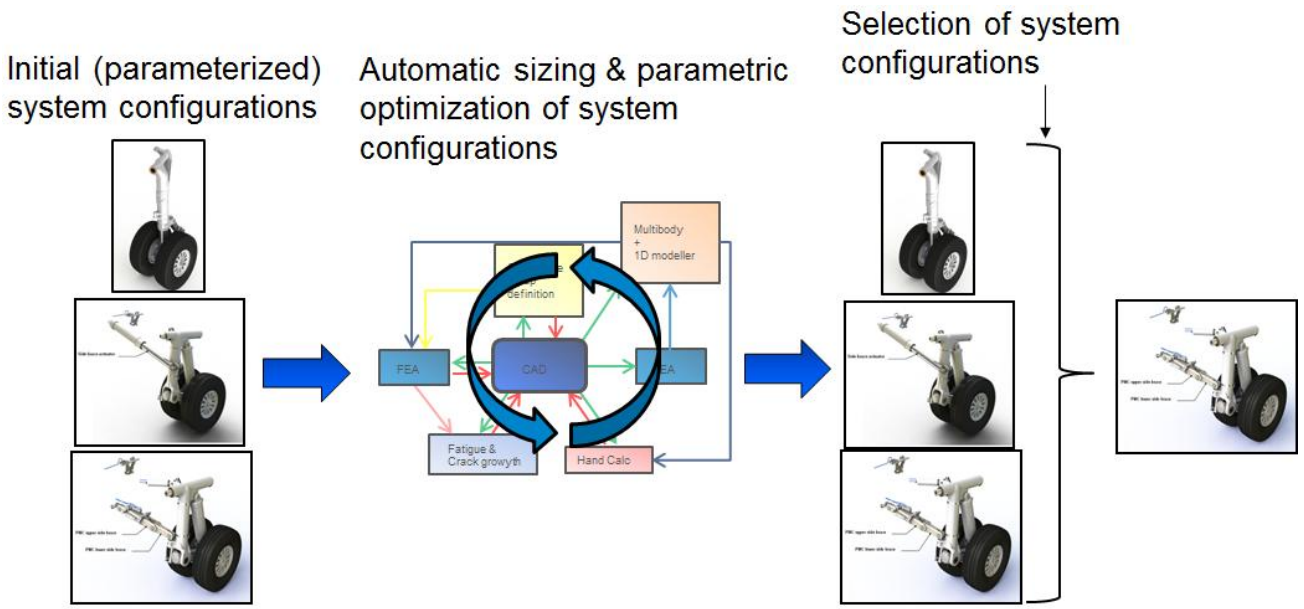
NH90 Shimmy example:



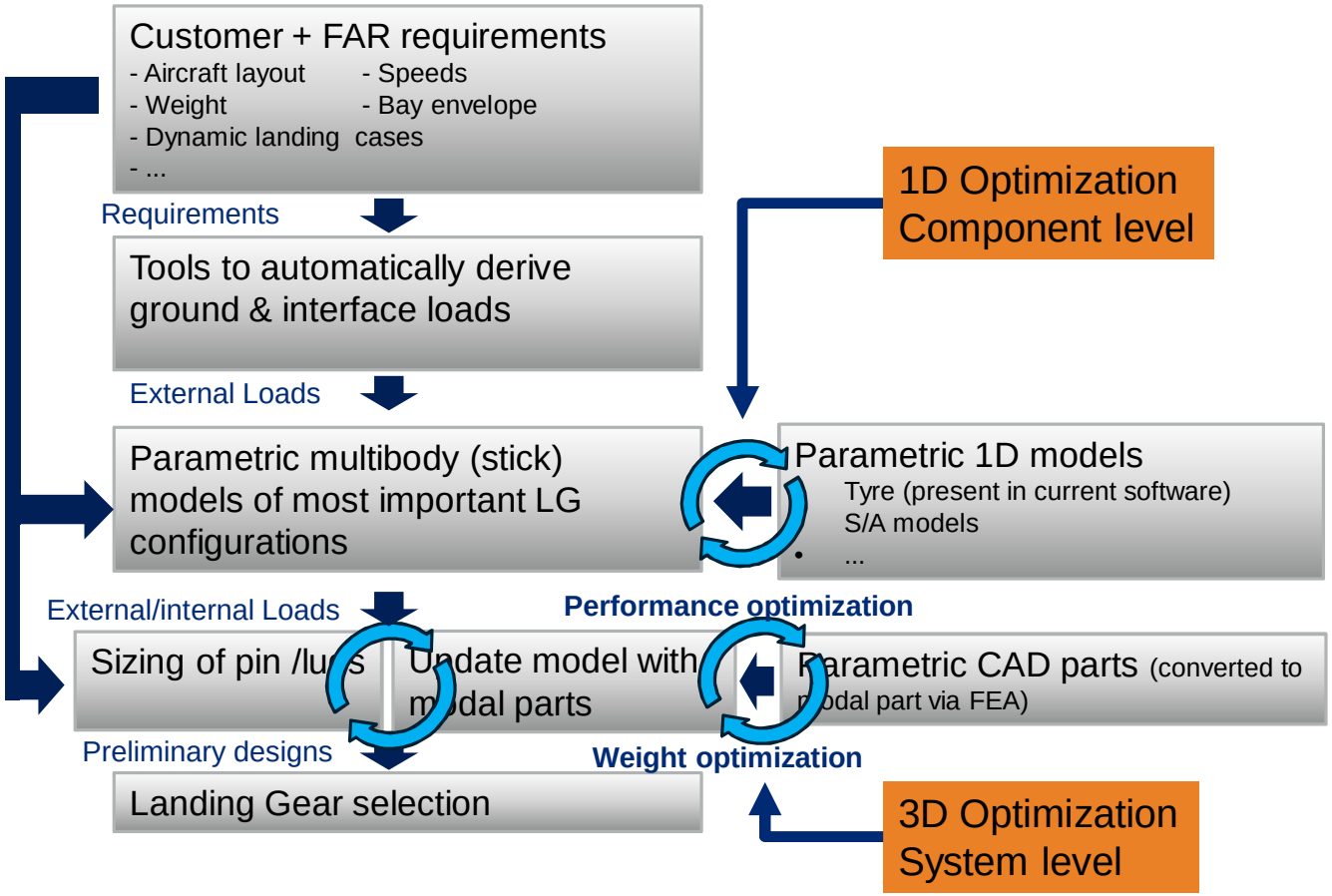


NEXT STEP: OPTIMIZATION OF THE DESIGN PROCESS

Create a tool to automatically size landing gear <u>preliminary</u> designs à proposal tool

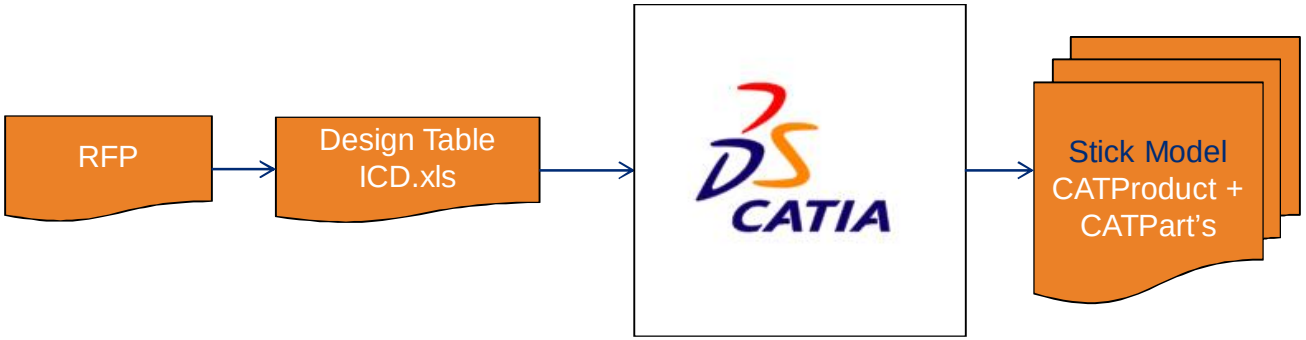


SCHEMATIC STEPS IN THE OPTIMIZATION PROCESS

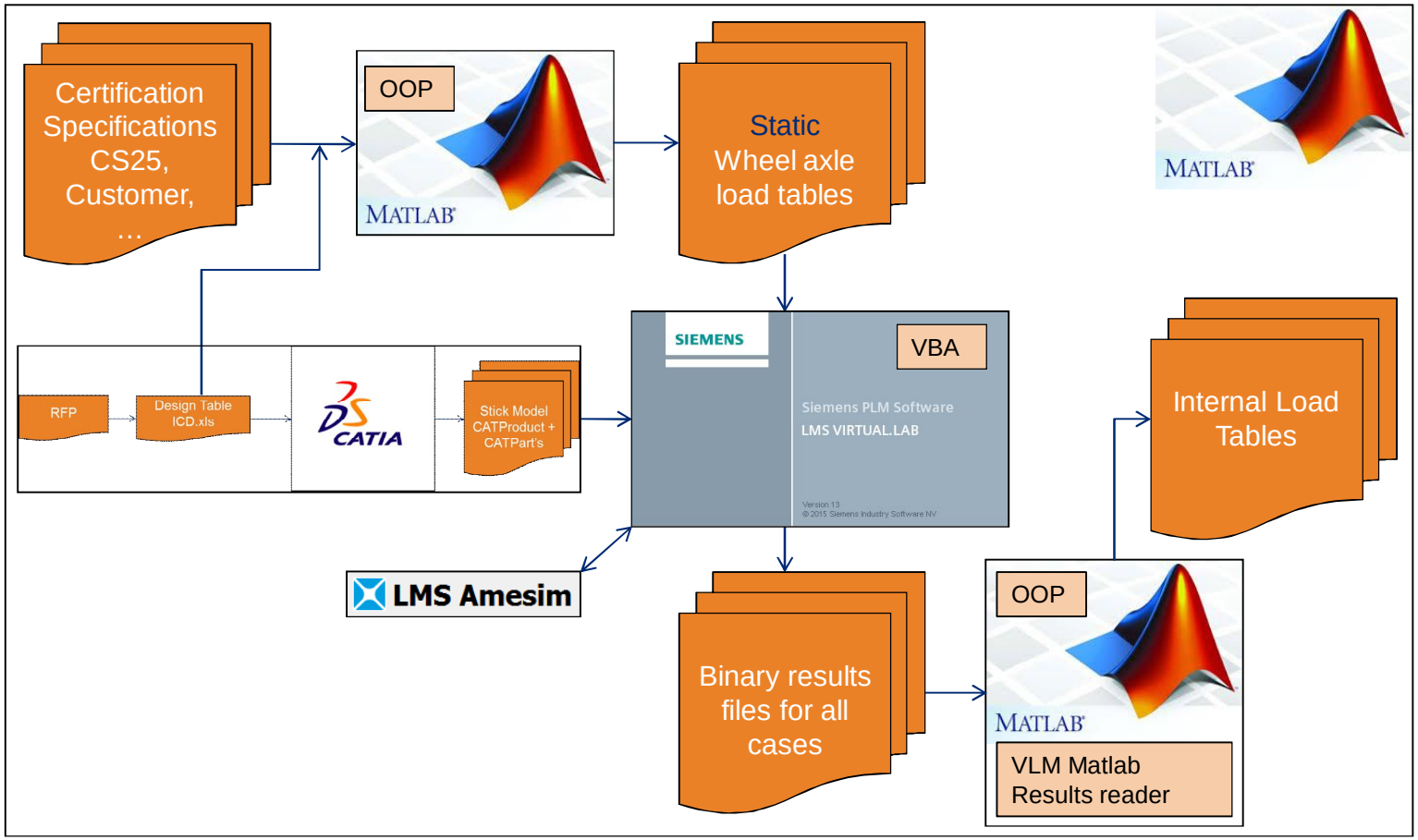


MATLAB DRIVEN DESIGN TOOL
Reuse of 3D CAD Effort à Stick Model

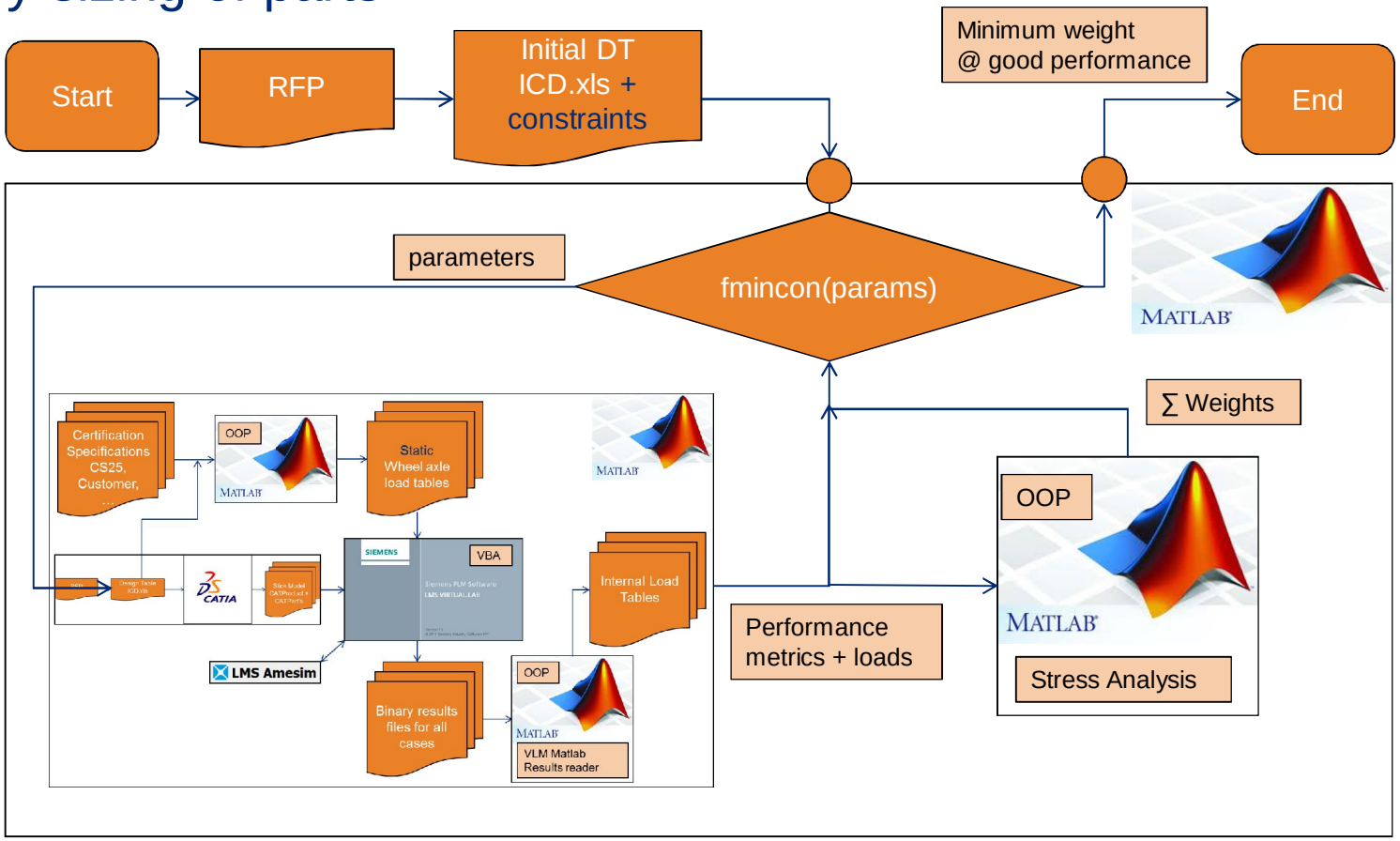
§ Stick model is built from a single Design Table (DT) xls file
§ Full parametric approach
§ Stick model + DT stored in Enovia



EXTERNAL AND INTERNAL LOADS



OPTIMIZATION
Preliminary sizing of parts

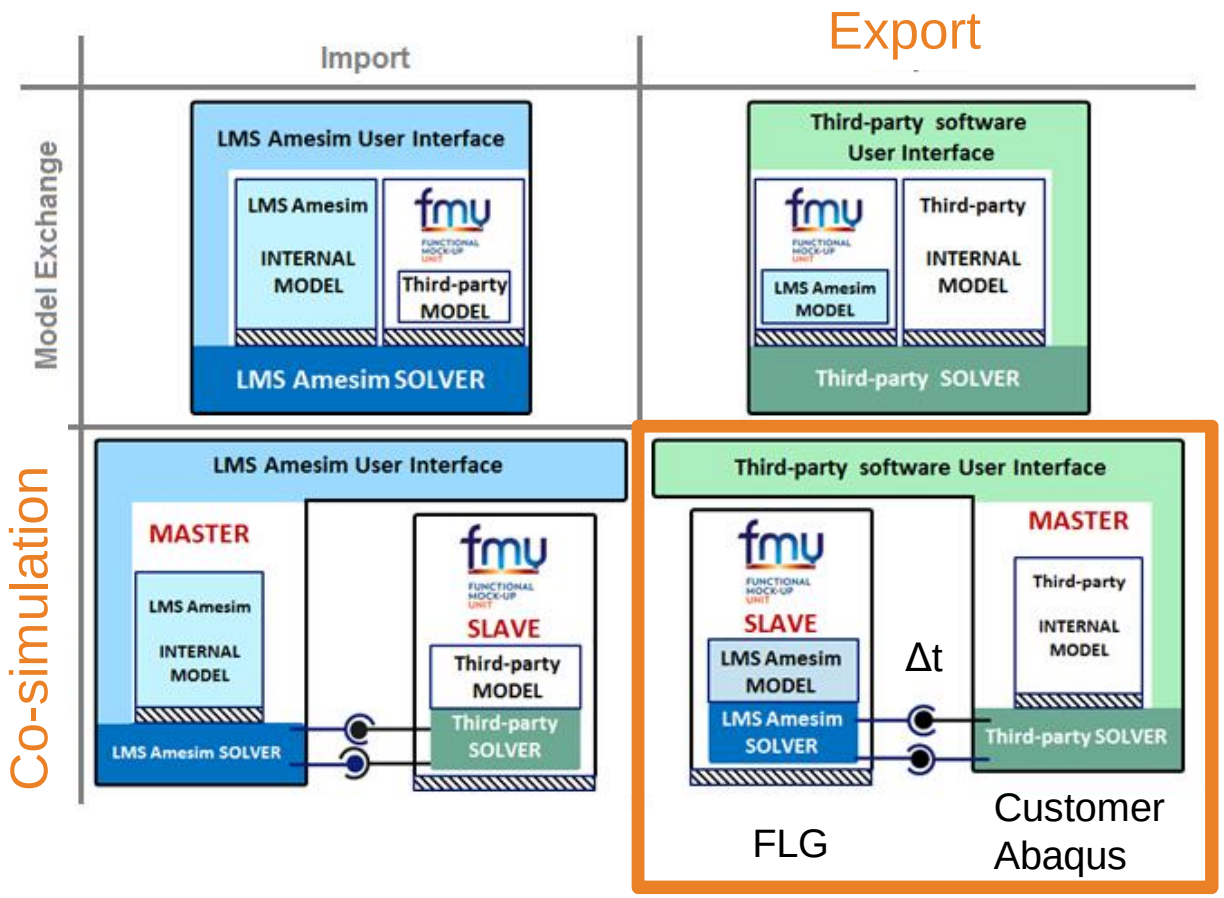


CURRENT STATUS

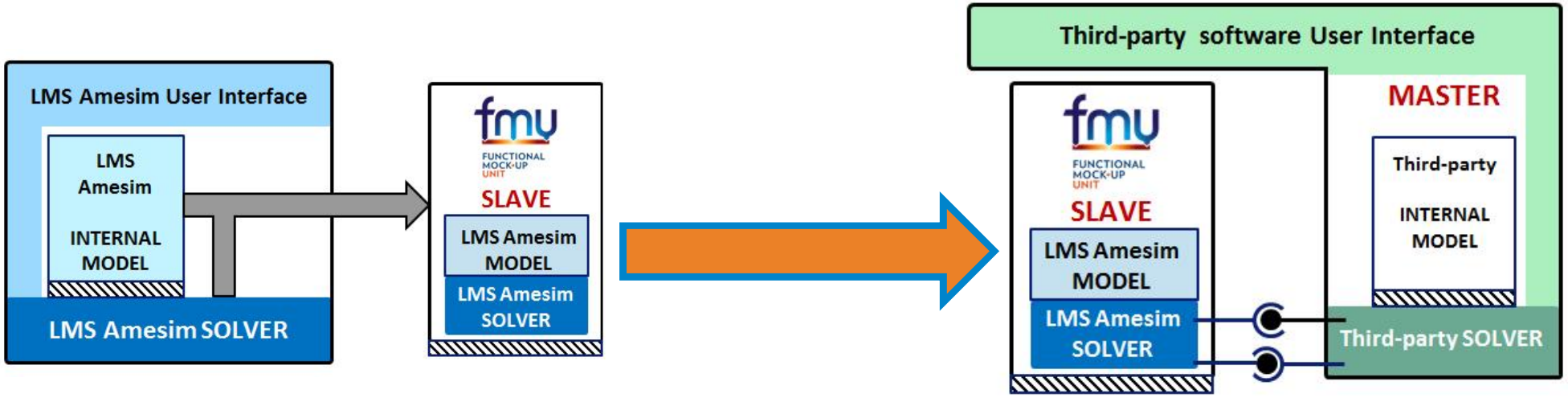
- Multidisciplinary Design Optimization for Flexible Systems
  - Design based on single truth parameter file (Design, Stress, Dynamics)
  - Modally reduced CAD parts
  - Stress à Weight
  - Performance
  - Cost
- Dynamic landing cases
- Re-use of components via FLG libraries
  - Submechanisms à SimCenter?
  - Rigid stick models vs. parametrized flexible models
  - Shock absorbers models (via cosim with AMESim)
- Parametric CAD parts
  - Parametric design in Catia à SimCenter, NX/Catia import?
  - Automatically generated flexibility? à SimCenter? NX Nastran

- Exporting the 1D model for our customers by FMU compilation

POSSIBLE FMU INTERFACES/PROCESSES



FMU COMPILATION AND THIRD PARTY COSIM USE



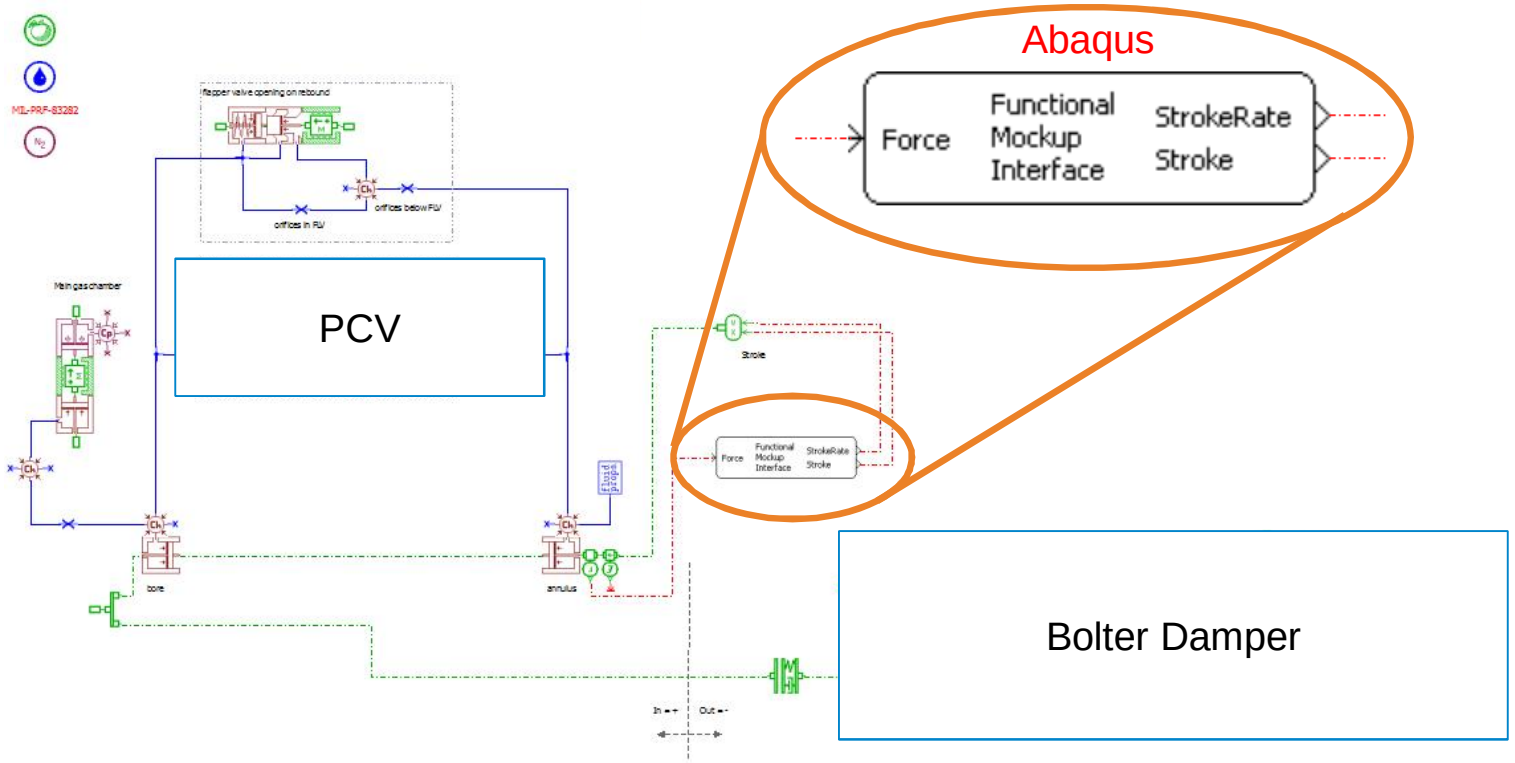
FLG / AMESim

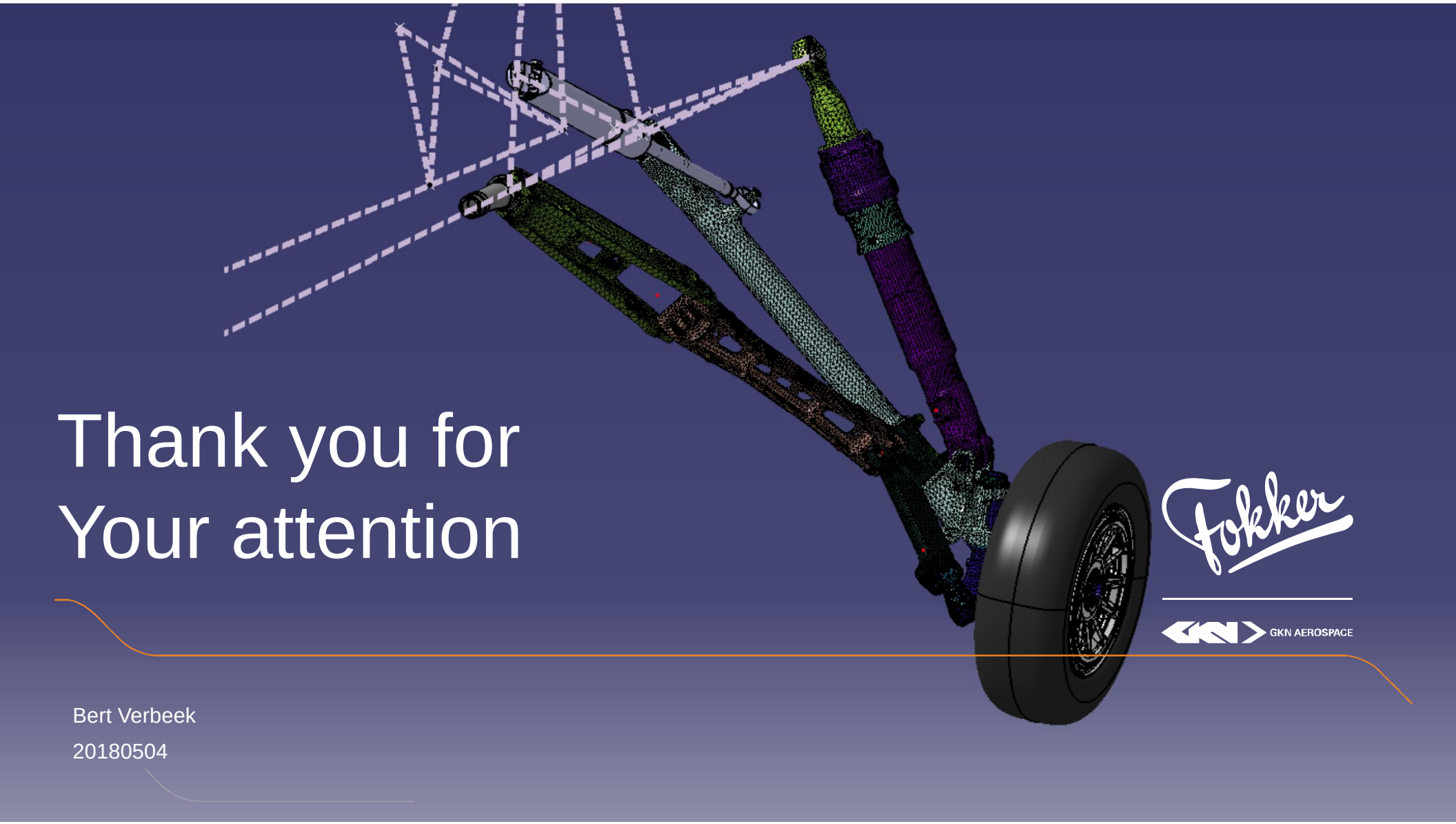
IP protection:

Exposed elements
- Low: input/output only
- User: watch par/vars
- Hgh: full exposure

Customer / Cosim Abaqus

AMESIM MODEL FMU INTERFACE BLOCK





Thank you for Your attention

Fokker

GKN AEROSPACE

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