LoCo

Multistage Assembly with a wheel generation process example.

Alexandru Saharnean

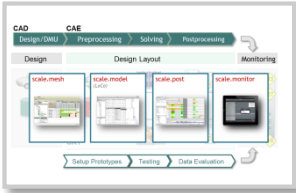**Marko Thiele**

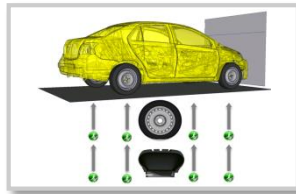**Daniel Rentsch**

May 2016

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Agenda

LoCo in SCALE.sdm
- Overview of LoCo's part in the SCALE.sdm chain
- Key Features

Assembly Process and Multistage Assembly
- Assembly Process with LoCo
- Multistage Assembly overview

Wheel generation with Multistage Assembly
- Example overview
- LoCo setup
- Assembly processes

Summary, Conclusions and Outlook

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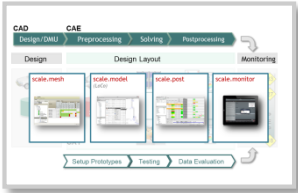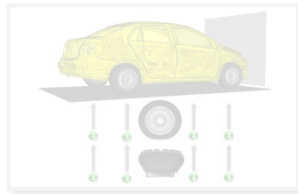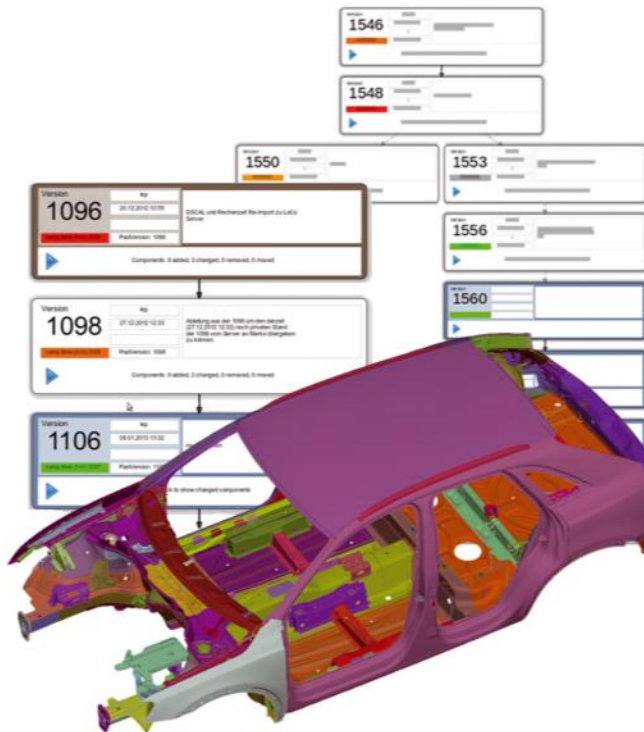- Multistage Assembly overview

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Summary, Conclusions and Outlook

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LoCo in SCALE.sdm:

CadMe	LoCo	CAViT	Status.E

CAD/Meshing ▶ Modelling ▶ Solving ▶ Results ▶ Monitoring

- **Simulation Data- / Variant Management**
  - Workbench for Simulation Engineers
  - Unique RichClient/Offline-concept with sync-mechanism *(internal/external)*

- **Workflows / Features**
  - Integration of arbitrary CAE processes
  - Solver: PAM-Crash, LS-DYNA, Nastran, Abaqus, …
  - Job submit and monitoring
  - Optimization, robustness, DOE, …
  - Quality checks of models
  - Advanced security features
    - Two factor authentication
    - Encryption
    - Sophisticated roles and rights management
  - Distributed, collaborative work environment
  - ….
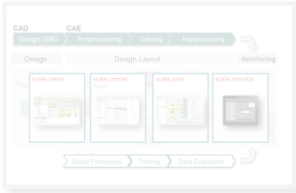
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Agenda
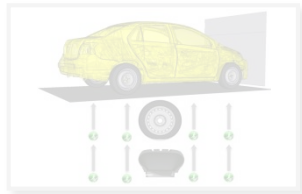
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SCALE.sdm: *Assembly process*

- **Assembly input data**
  - Get assembly specific components
  - Build main input file *(template based)*
  - Run user specified scripts

- **Solving step**
  - Start solver *(locally or HPC cluster)*
  - Monitor solving process

- **Operations after Solving**
  - Run user specified scripts
  - Download results to workstation
    (if solving was on HPC cluster)
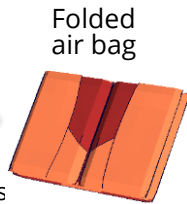 - Upload results to LoCo-Server or other Storage System

component pool

Assembly + solving

Extraction + Archiving

workstation

Storage System
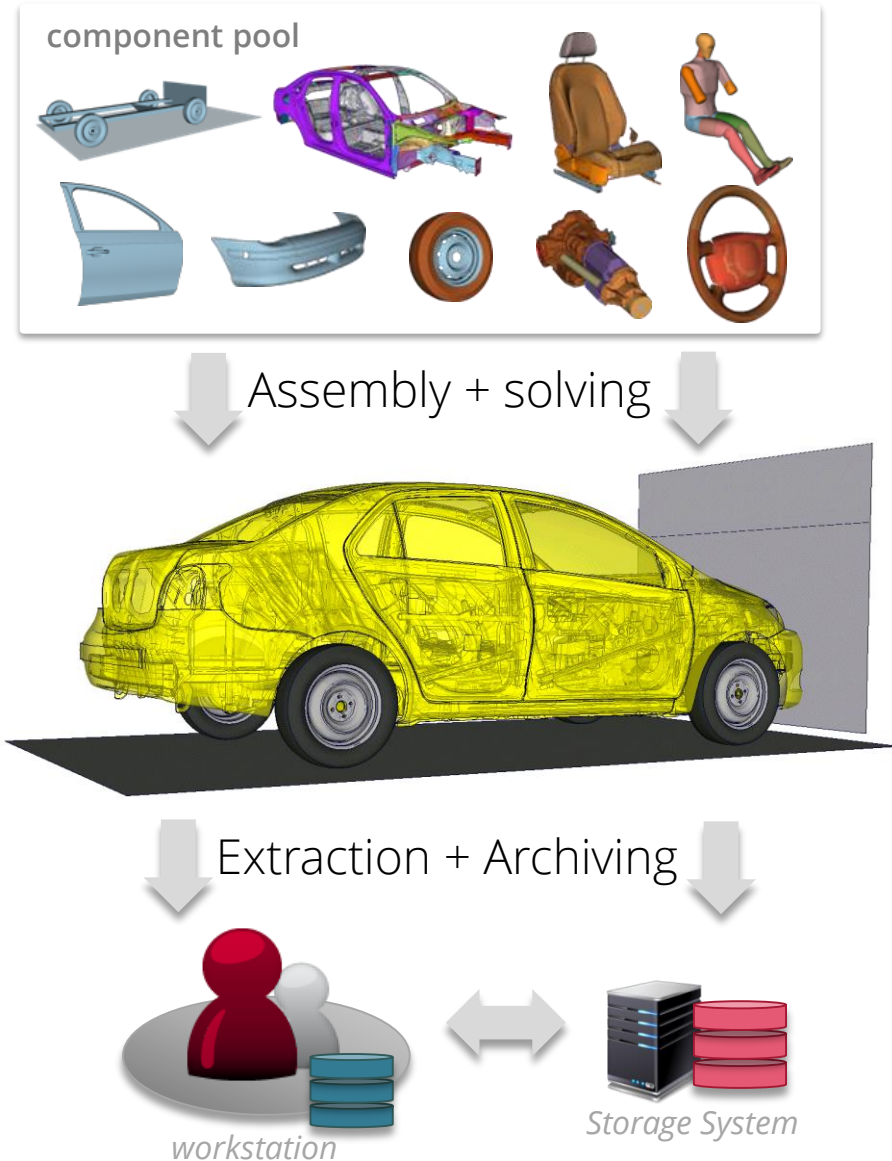
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SCALE.sdm: *Multistage assembly process*

Bag folding

- Bag geometry
- Housing
- Tools
- Parameters

Folding simulations

Folded air bag

Inflate and load wheel

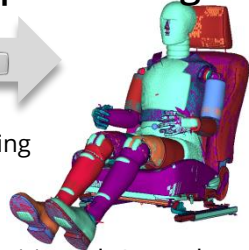- Rim
- Tire
- Parameters

Wheel simulations

Inflated and loaded wheel

Dummy, Seat, Belt positioning

- Dummy
- Seat
- Belt
- Parameters

Preprocessing
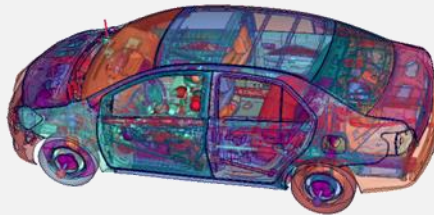
Positioned, Seated and belted Dummy

...

...

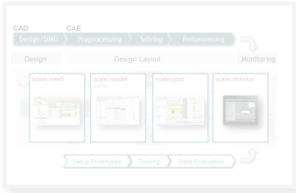## car assembly

Assembled car model

car 2 car assembly

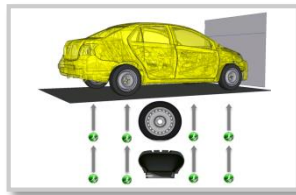Assembled car 2 car crash model

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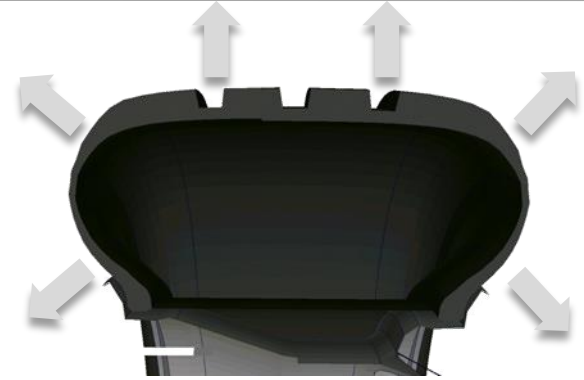- Example overview
- LoCo setup
- Assembly processes

Summary, Conclusions and Outlook

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SCALE.sdm: *Wheel generation example*
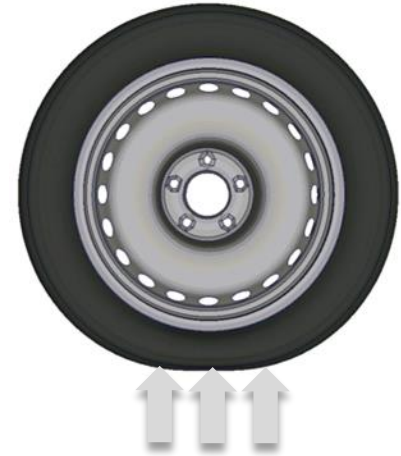
- **Simulate the wheel inflation:**
  - Individual simulation;
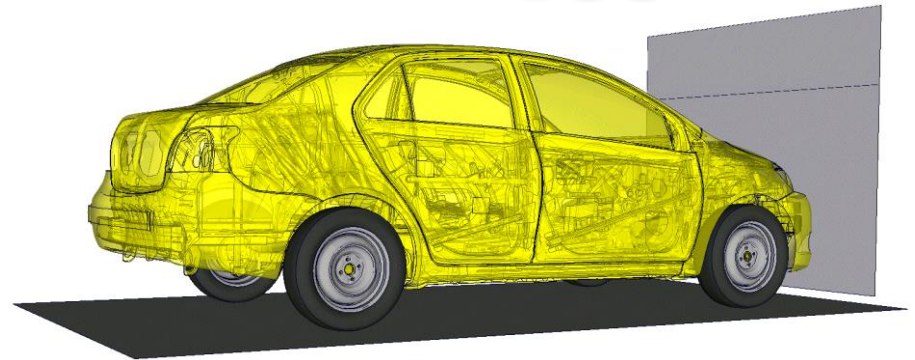 - Uses a rim component;
  - Uses a tire component.

- **Simulate the wheel loading:**
  - Individual simulation;
  - Uses the inflated wheel.

- **Inflated and loaded wheel can now be used in a car crash simulation:**
  - Individual simulation;
  - Uses 4 inflated and loaded wheels.

0335_YARIS_EuroNCAP_RW_____f_50kmh_lhd_

🗃	Rad		vo_li_loaded
🗃	Rad		vo_re_loaded
🗃	Rad		hi_li_loaded
🗃	Rad		hi_re_loaded
🗃	Rad	R01	vo_li_loaded
🗃	Rad	R01	vo_re_loaded
🗃	Rad	R01	hi_li_loaded
🗃	Rad	R01	hi_re_loaded

ab_rad_2.8bar_vo_li_abpl500kg
  ▽ 📁 Run Output
      📄 vo_li_loaded.R01
      📄 vo_li_loaded.inc
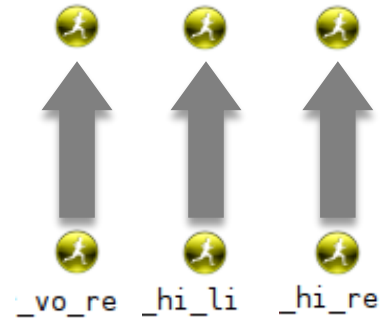
Import run output component...
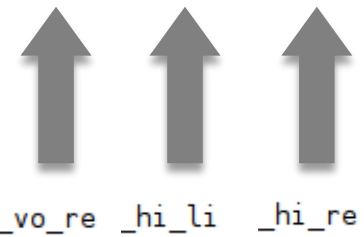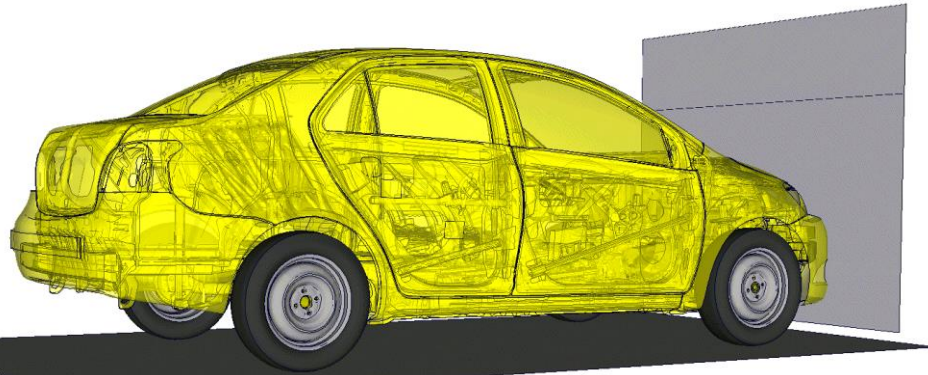
au_rad_2.8bar_vo_li
  ▽ 📁 Run Output
      📄 vo_li_pumped.R01
      📄 vo_li_pumped.inc

Import run output component...

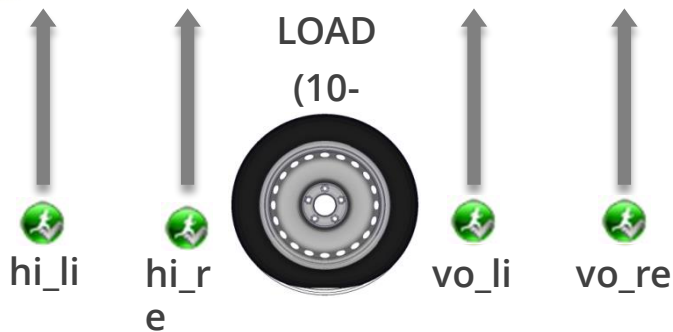_vo_re   _hi_li   _hi_re

_vo_re   _hi_li   _hi_re

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SCALE.sdm: *What happens when the car job is assembled*

Starting car crash simulation(~10h):

`0335_YARIS_EuroNCAP_Rw_____f_50kmh_lhd_`

LOAD (10-

hi_li   hi_re   vo_li   vo_re

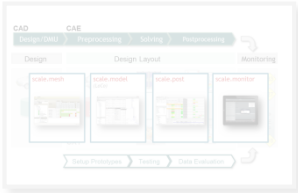**INFLATE (10-15min)**

hi_li   hi_re   vo_li   vo_re

requires:
- LOAD vo_li;
- LOAD vo_re;
- LOAD hi_li;
- LOAD hi_re.

requires:
- INFLATE vo_li;
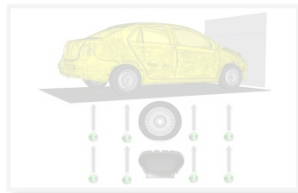- INFLATE vo_re;
- INFLATE hi_li;
- INFLATE hi_re.

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Agenda

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SCALE.sdm: *Summary, conclusions and outlook*

■ Summary:

- ▪ With multistage assembly, results from specified simulations can be automatically imported and used in further simulations
- ▪ The dependency of an imported result of a subassembly is remembered and used by LoCo
- ▪ Changes to the input of subassemblies are automatically recognized and the corresponding subassemblies are automatically carried out before the main assembly;

■ Conclusions:

- ▪ With multistage assembly, the run configurations and the dependencies between them have to be defined only once
- ▪ A high degree of process automation is achieved
- ▪ The steps that have to be performed by user are significantly reduced

■ Outlook:

- ▪ Enhanced user interface for setup of subassemblies
- ▪ Parallel running of multiple subassemblies and their corresponding simulations

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Thank you for your attention!

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