New Concepts in CAE Data and Process Management in Car Development

Marko Thiele
Martin Liebscher
Heiner Müllerschön
DYNAmore GmbH

DYNA
MORE

Contents

Introduction - Classification

Report of design changes

Design improvements

CAD

CAE

| Design/DMU | Preprocessing | Solving | Postprocessing |

Design

Design Layout

Monitoring

PDM

Pre-SDM

DB

CAT

| Setup Prototypes | Testing | Data Evaluation |

-33

-27

P E P

-18
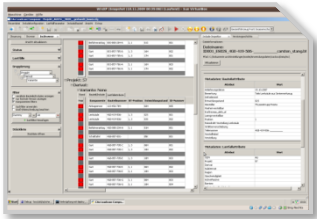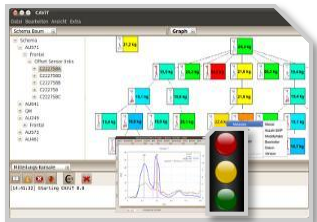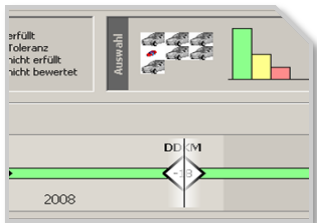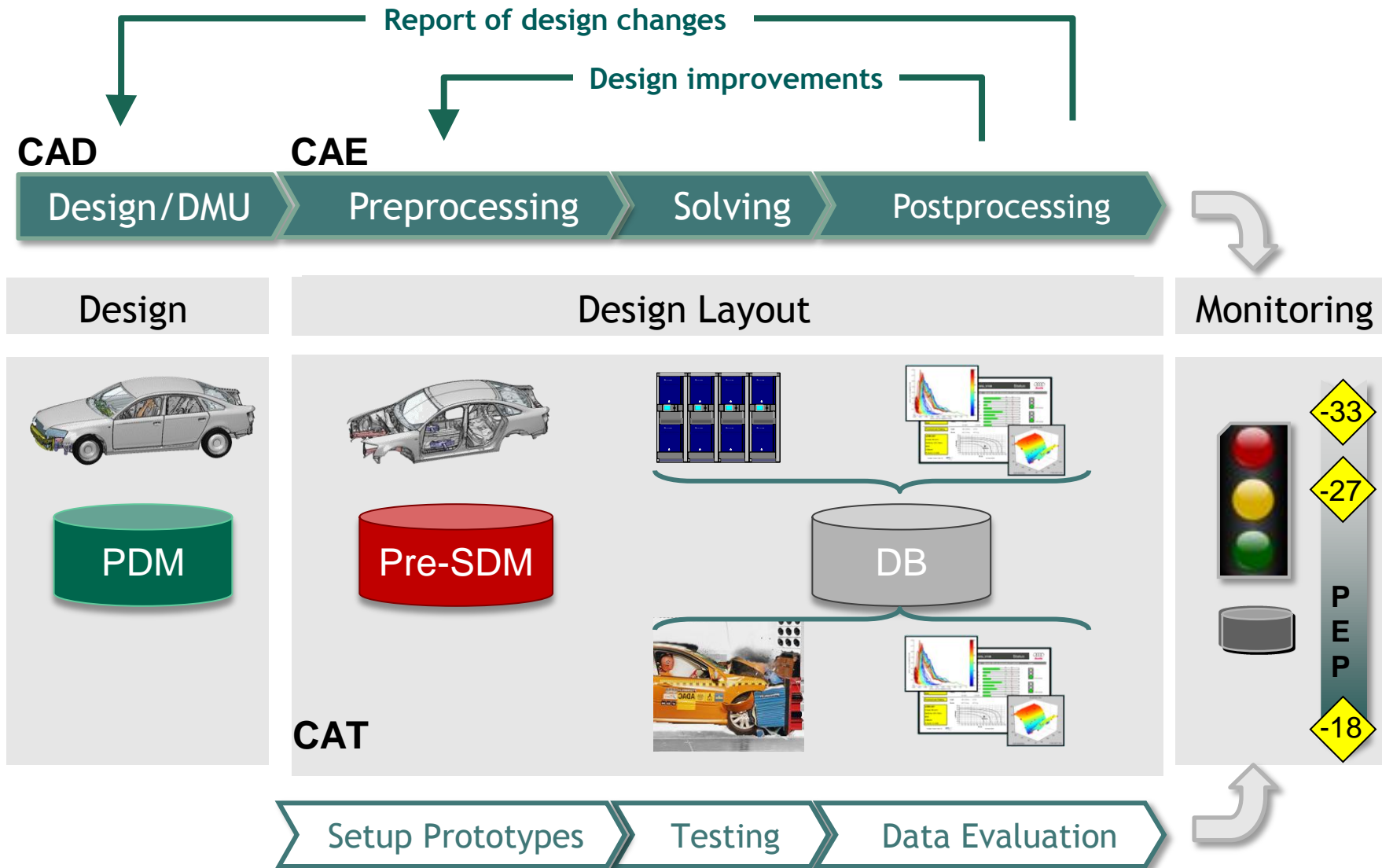
Introduction – Case Studies
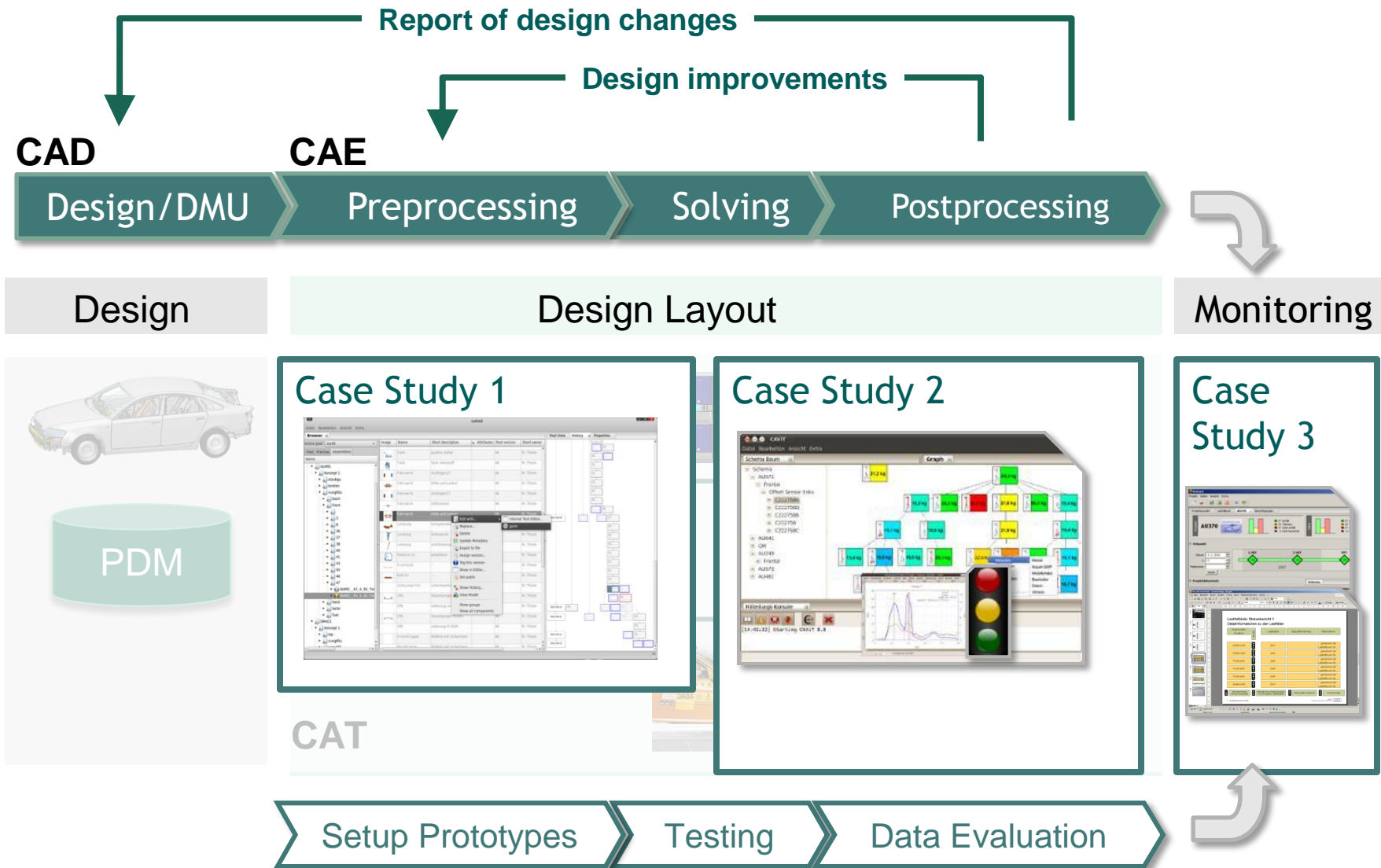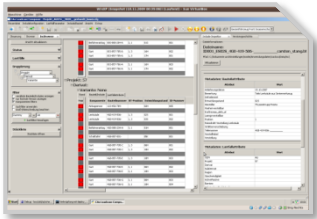
Report of design changes

Design improvements

CAD

CAE

Design/DMU > Preprocessing > Solving > Postprocessing

Design	Design Layout	Monitoring

PDM

Case Study 1

Case Study 2

Case Study 3

CAT

Setup Prototypes > Testing > Data Evaluation
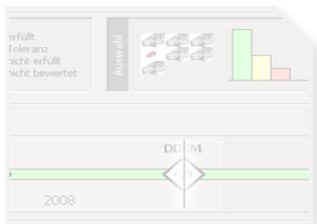
Contents

Case Study 1: *SDM-Solution*

Software System for Management of Simulation Input Data

- **Target Group**
  - CAE-engineers
  - Leader of simulation projects

- **Motivation**
  - **Synergy**   *Sharing of common parts*
  - **Transparency**   *Integrated documentation*
  - **Consistency**   *Synchronisation within all project members*
  - **Time Savings**   *Automation of processes*
  - **Homogeneity**   *Unification of the simulation data and enforce standards*

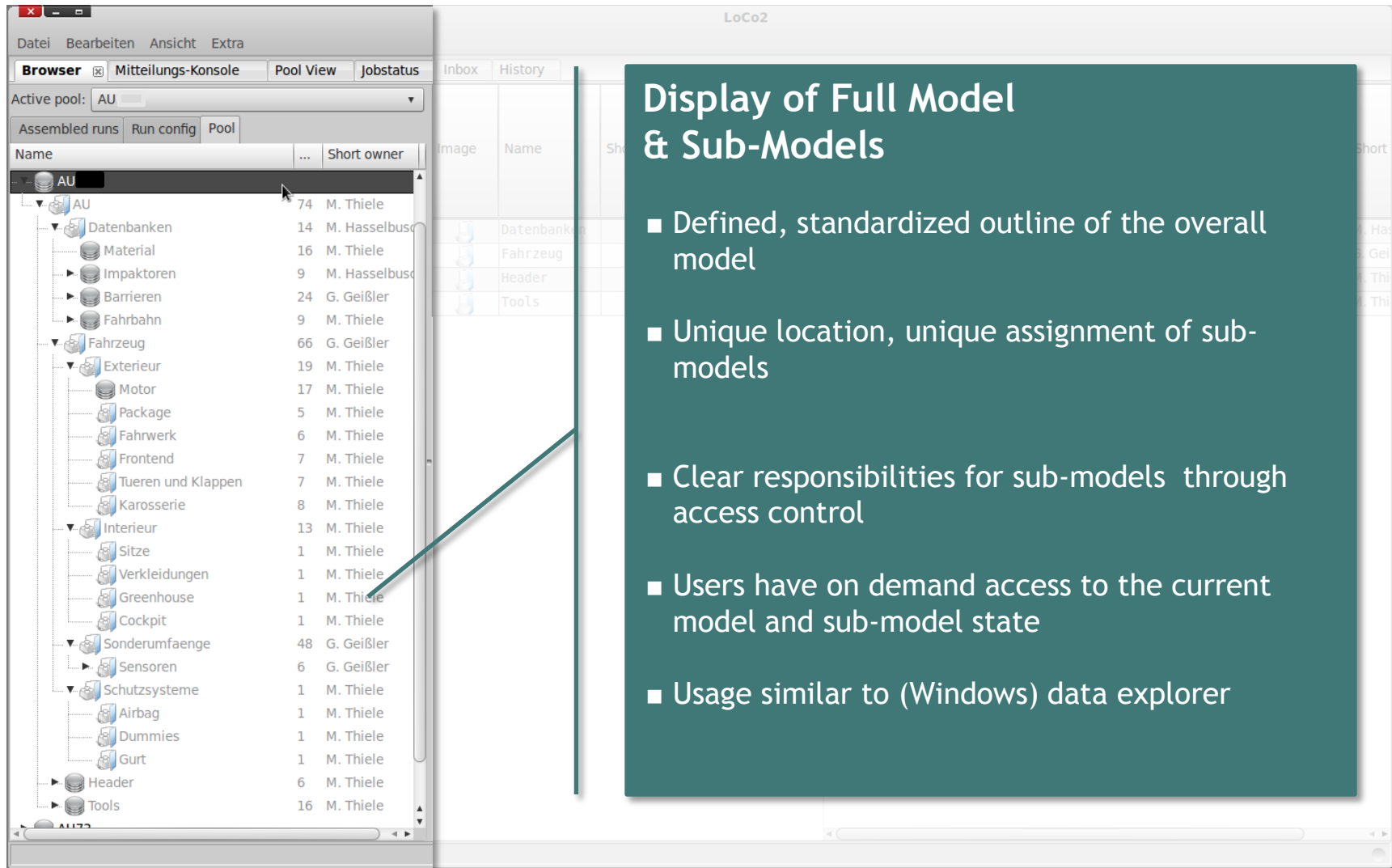# Case Study 1: *Workflow, Teamwork and Synchronization*
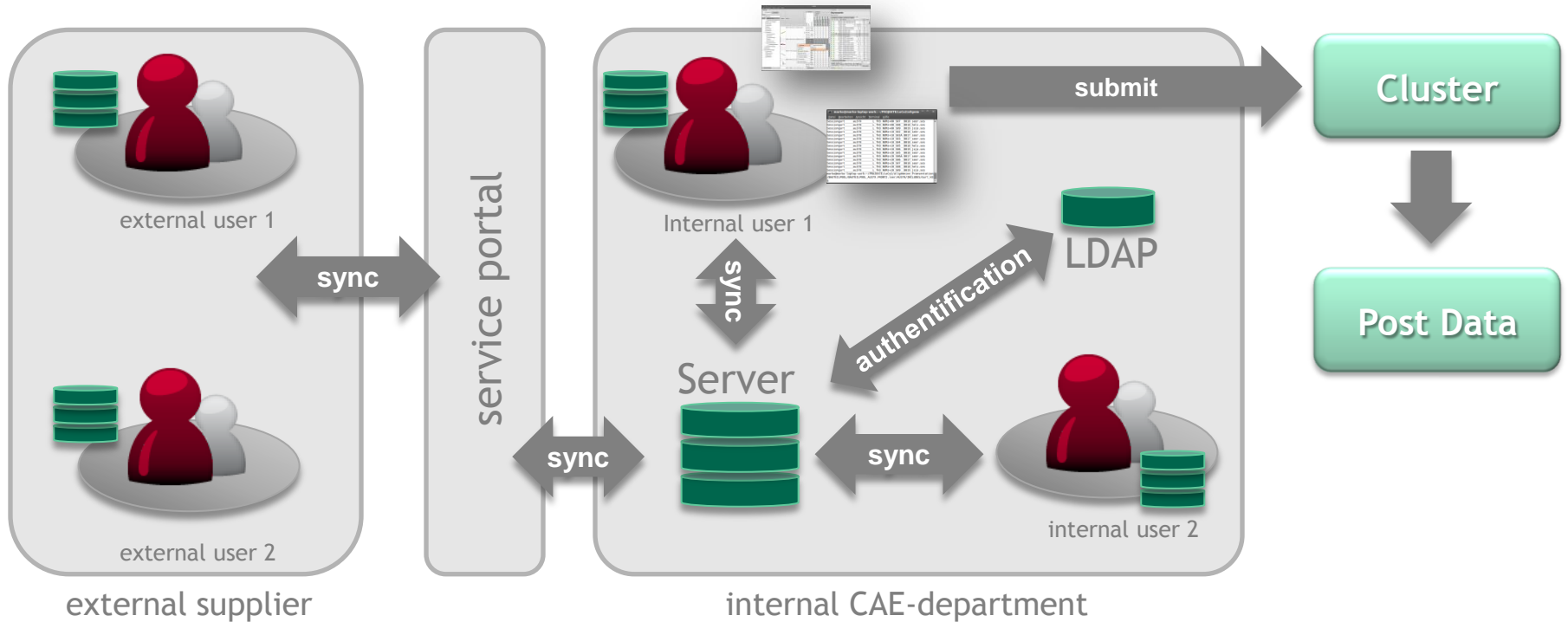
Sync
decentralized

- Central data storage, but synchronization with local cache
- Synchronisation even within teams or users

Offline / Online
performance

- Offline handling of components (RichClient)
  - Users/Teams are independent of servers and infrastructure
  - Users work with local data
  - Good performance while application of preprocessing tools
- Data transfer by means of web services

Case Study 1: *Features*

Display of Full Model & Sub-Models

- Defined, standardized outline of the overall model

- Unique location, unique assignment of sub-models

- Clear responsibilities for sub-models through access control

- Users have on demand access to the current model and sub-model state

- Usage similar to (Windows) data explorer

DYNA MORE

Case Study 1: *Features*

Clarity

- Listing of all include files (sub-models)
- Thumbnails for quick overview

Intuitive

context-sensitive actions

Case Study 1: *Features*

History

- Visualization of generation order
- Tracking of target values
- Comments
- Thumbnails with visualization of changed parts
- Different zoom levels

Case Study 1: *Features*

Pictures

- Automated generation while importing data
- Highlight of changes

Case Study 1: *Features*

Modell Viewer

- Quick visualization of input data
- automated highlightning of modified parts

Case Study 1: *Features*

Quality Management

- Check at each import
- User defined checks configurable
- Sanctionable on the basis of a quality index

Bill of Materials

- Overview of all parts and their properties (mass, materials...)
- „on the fly"-modification of gauge thicknesses

S	D	PID	PName		Thickn	TotalMas
✓		9807001	Deckplatte Stahl	...	20.00	125.600
✓		9807999	RIGIDWALL		1.00	68.688
✓	↑	9807002	Anschlussplatte Stahl	...	1.20	7.536
✓		9999000	Part Versionsnummer		1.00	3.915
✓		9808001	STAHL BAR Messbalken mit...		-	2.779
✓		9805001	DECKBLECH VORN	...	0.81	1.319
✓		9805002	DECKBLECH OBEN	...	0.81	1.040
✓		9805003	DECKBLECH UNTEN	...	0.81	1.040
✓		9806001	BUMPER-DECKBLECH	...	0.81	0.720
✓		9899003	TIED Part Klebekontakt Barr...		-	0.000
✓		9899002	TIED Part Klebekontakt Bu...		-	0.000
✓		9899001	TIED Part Klebekontakt Bu...		-	0.000
⊘		9801001	BLOCK	...	-	-
⊘		9802001	BUMPER	...	-	-

Number of parts: 14
Total: ?
Total (Selection): 1.3 kg (S: 1.319 kg / N: 0.000 kg), dM: +0.000 kg

Barriere
ODB v40 Defoelem

Component Images Comments Reports BOM

Case Study 1: *Open System / Integration of Software*
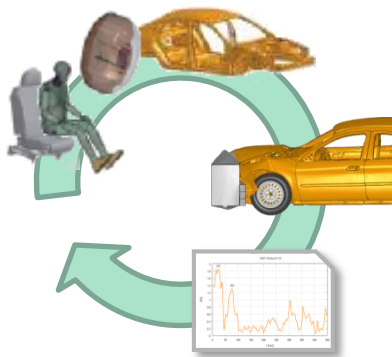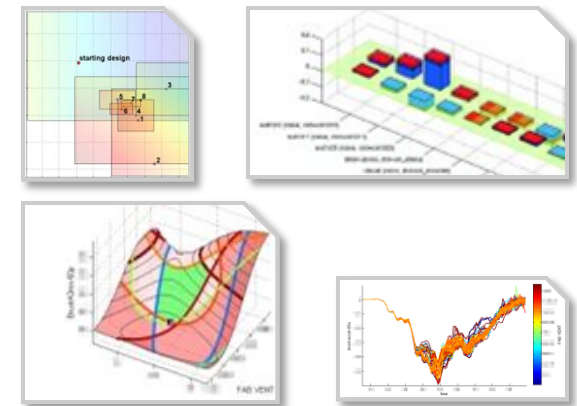
Direct application of external tools *(Ansa, Animator, nedit, vi, Userskrips, etc…)*
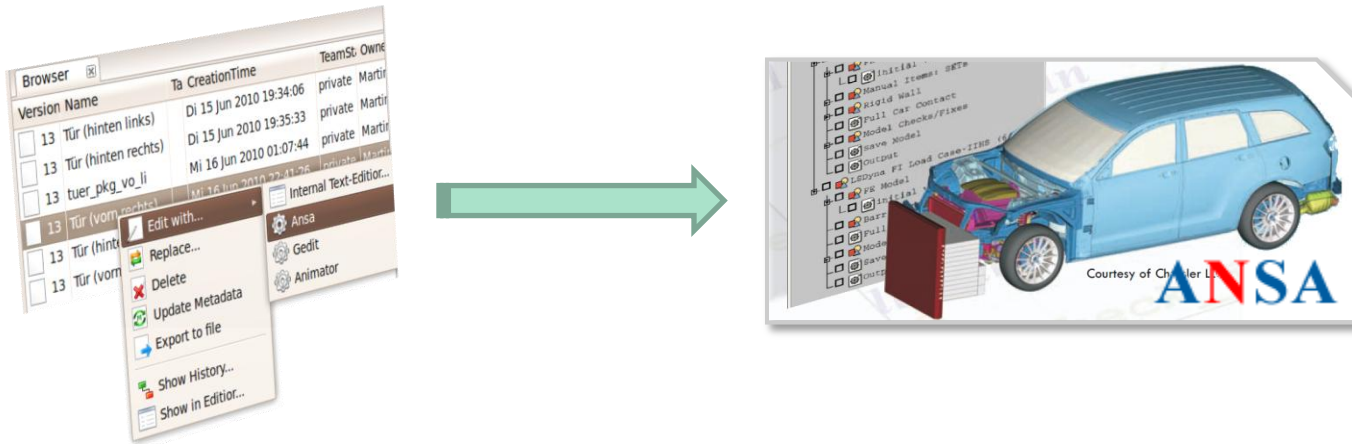
Integration of DOE Studies / Optimization

- Models are parameterized within the data management system

- Simulation models are assembled automatically

- Access to optimization software such as LS-OPT
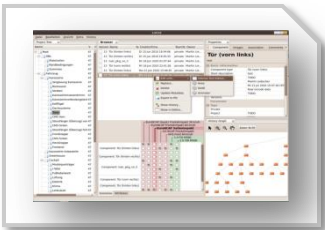
Summary - Case Study 1

Customizable Rich Client

- Adaptation to customer requirements
- Structuring / standardizing of work flow
- Continuous documentation of components and sub-models

Modul Strategy for Simulation

- Simple cross-disciplinary reusability of components
- Rights and role management for exchange with suppliers or other teams

Intuitive Usage

- Report of simulation model staus on demand
- Interface focus on established work processes
- Tailored to the needs of simulation engineers
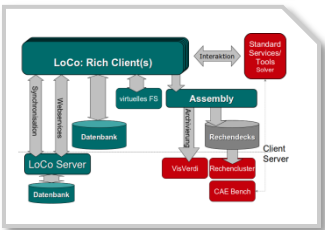
Very Good Performance

- Largely independent of the performance of the network infrastructure
- Synchronization automatically in the background
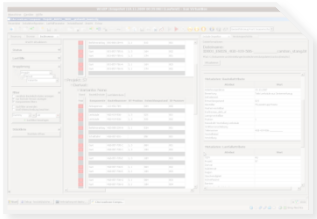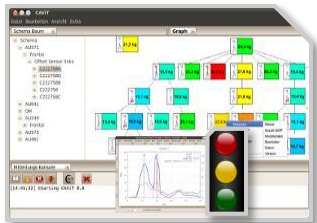- Use of efficient mechanisms for data reduction

Contents

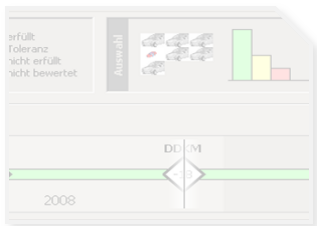## Introduction

Classification
Motivation

Case Study 1

CAE data- and variant management, administration of data, collaborative work, integrated documentation
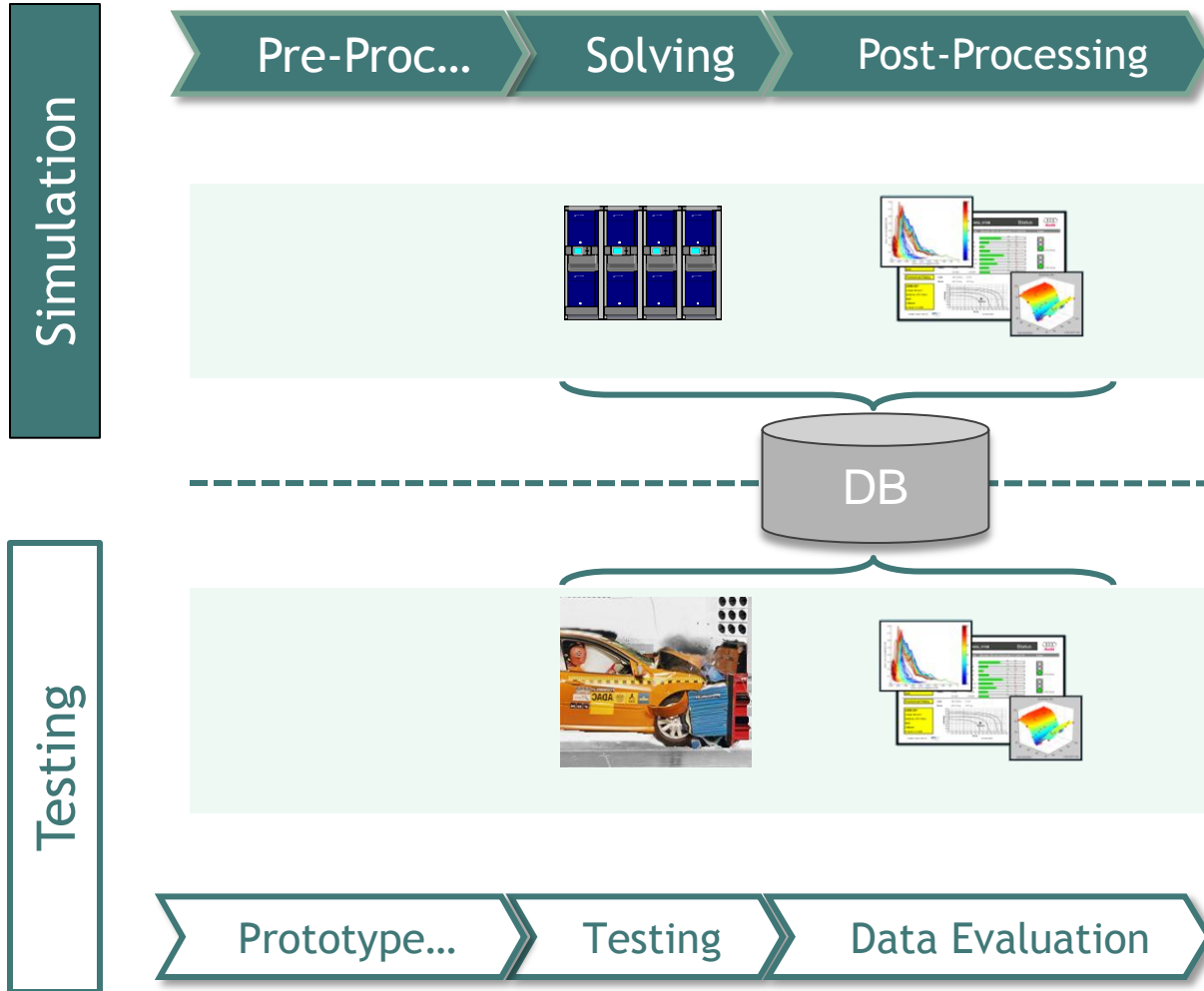

Case Study 2

Automation of result extraction, reporting, comparison simulation/testing

Case Study 3

Monitoring of development status

Case Study 2: *Analysis and Evaluation of CAx Data*

Simulation

| Pre-Proc... | Solving | Post-Processing |

Testing

| Prototype... | Testing | Data Evaluation |

DB

DYNA
MORE

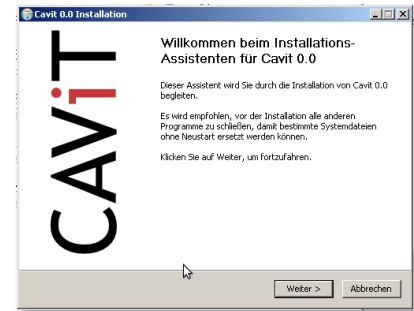# Case Study 2: *Analysis and Evaluation of CAx Data*

Software System for Data Collection and Evaluation of Test- and Simulation Data


- ■ **Target Group**
  - ■ Test and simulation engineers
  - ■ Component responsible people

- ■ **Motivation**

 | | |
  |---|---|
  | **Integration** | *Merging experimental and simulation data* |
  | **Evaluation** | *Support for automatic creation of standardized documentation / reports* |
  | **Assessment** | *Semi-automated evaluation and acquisition of key evaluations of individual experiments / simulations* |
  | **Comparison** | *Identification of differences between experiment and simulation* |

Case Study 2: *Analysis and Evaluation of CAx Data*
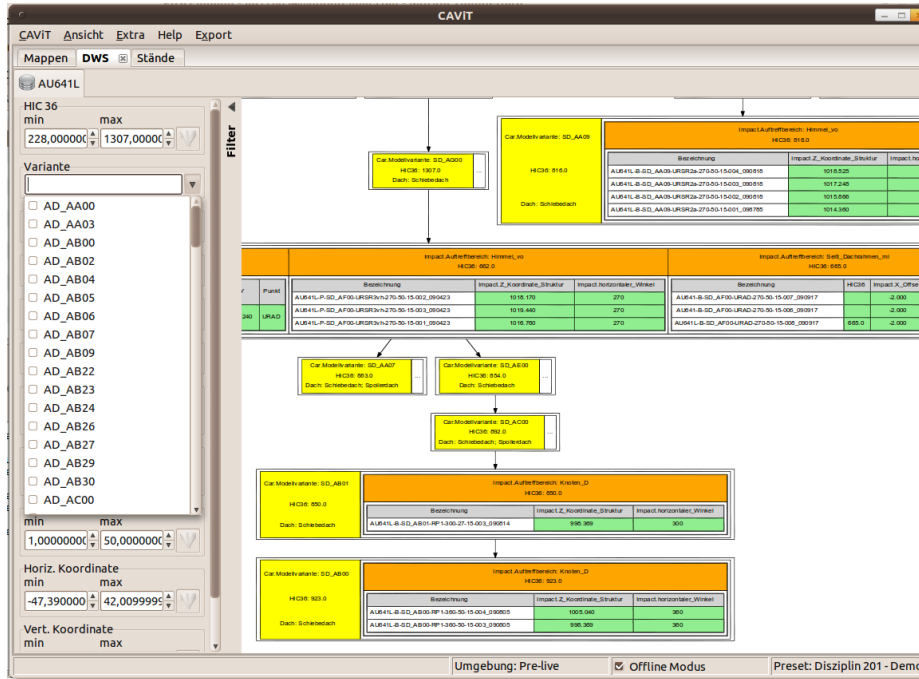
Characterization

- **Data collection from several backend systems**

- **Cache of data for fast local access, particularly important for bulk data**

- **Uniform handling of test and simulation data**

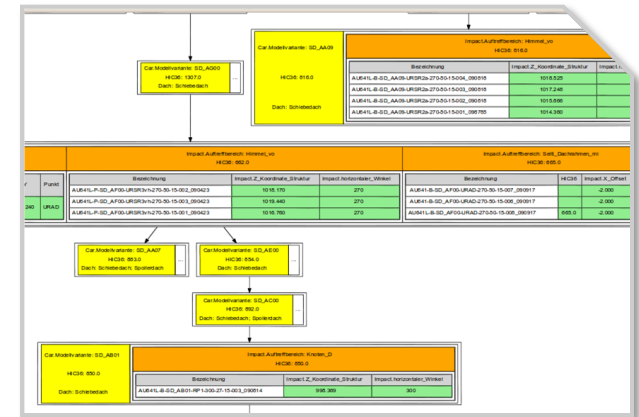- **Agglomerated view of data [configurable]**

  Pedigree representation

Data Collection

Testing   Simulation   Share Point
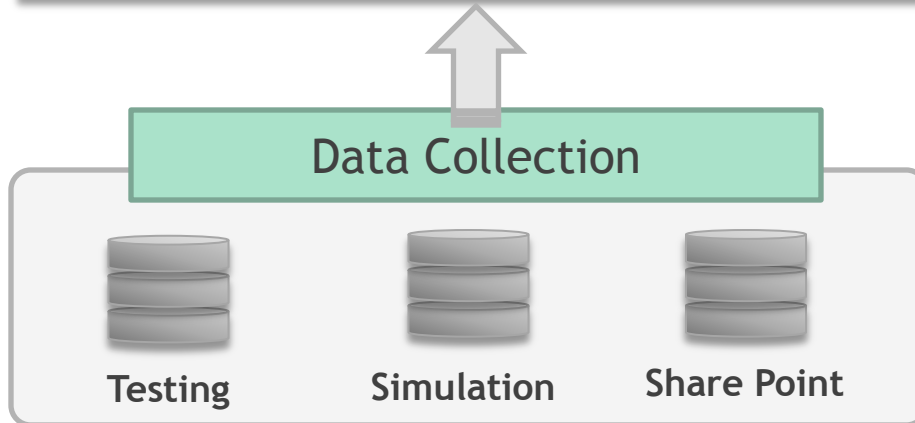
Case Study 2: *Visualization*

- **Visualization Features**
  - Graph / pedigree
  - Table view
  - Matrix representation

- **User Configurable View**

- **Automated color based assessment of results**

- **Representation of team project status**
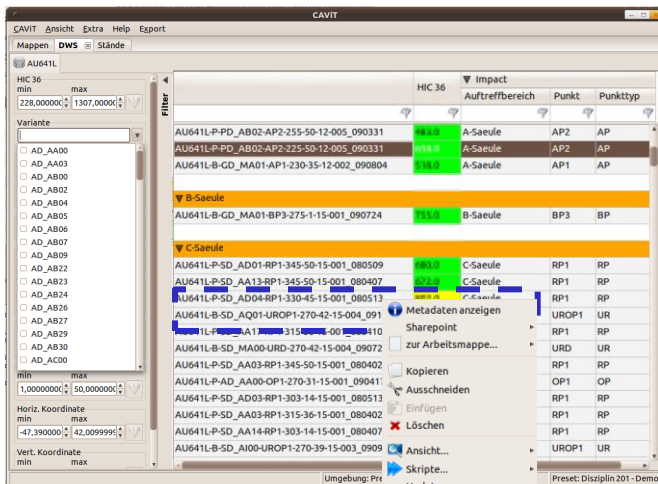
Graph
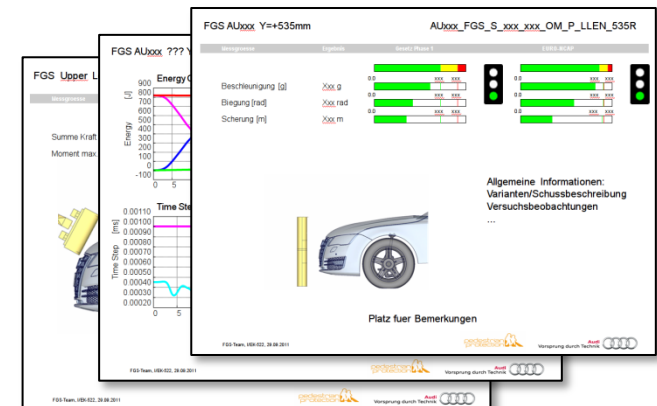

Table

Matrix

Case Study 2: *Scripting Extension – Open System*

- **Functionalities can be extended by user through "Scripting Extensions"**

- **Arbitrary script languages can be applied**

- **Template technology is cross platform available (Windows and Linux)**

- **Application**
  - Automation of report generation
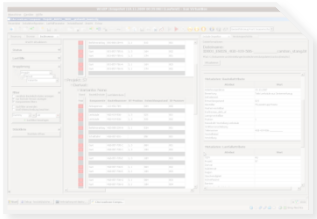 - Interface to other applications

[FalCon]
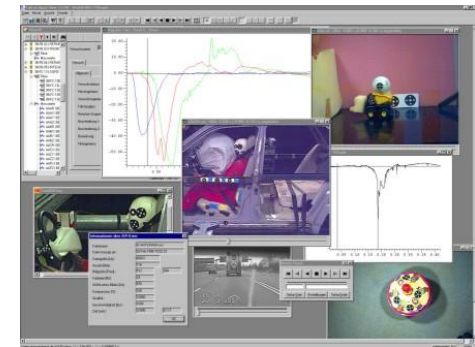
[Animator]

Contents

Introduction
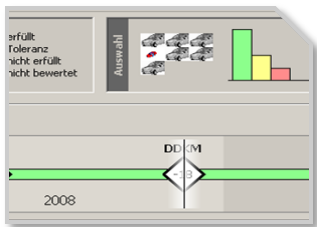
Classification
Motivation

Case Study 1

CAE data- and variant management, administration of data, collaborative work, integrated documentation
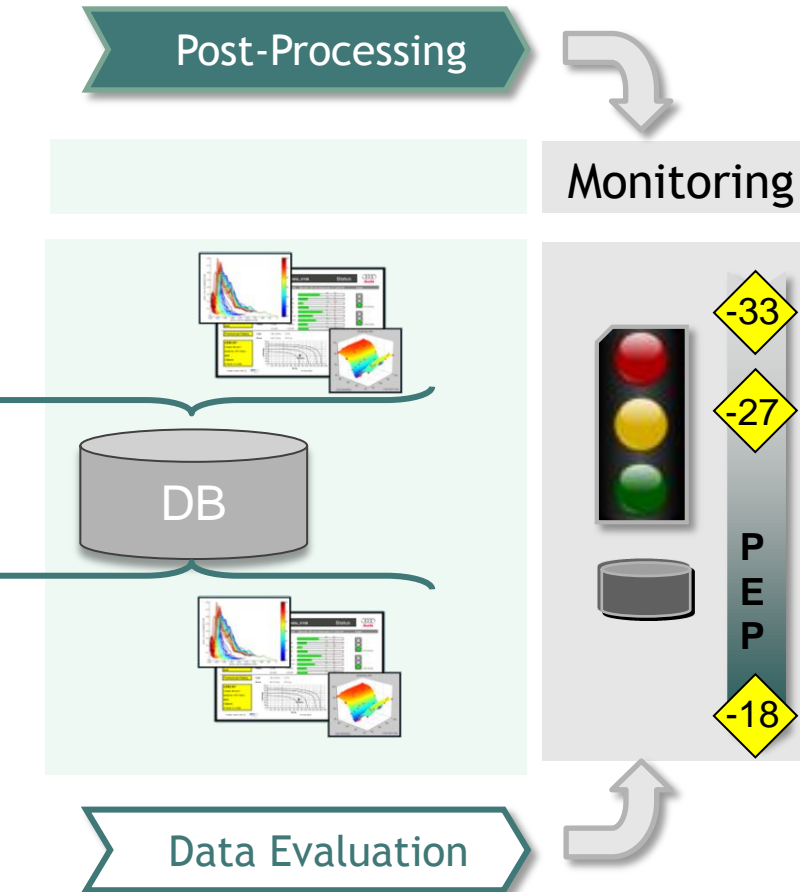

Case Study 2

Automation of result extraction,
reporting, comparison simulation/testing

Case Study 3

Monitoring of development status

Case Study 3: *Project- and Status Monitoring*

Post-Processing

Monitoring

DB
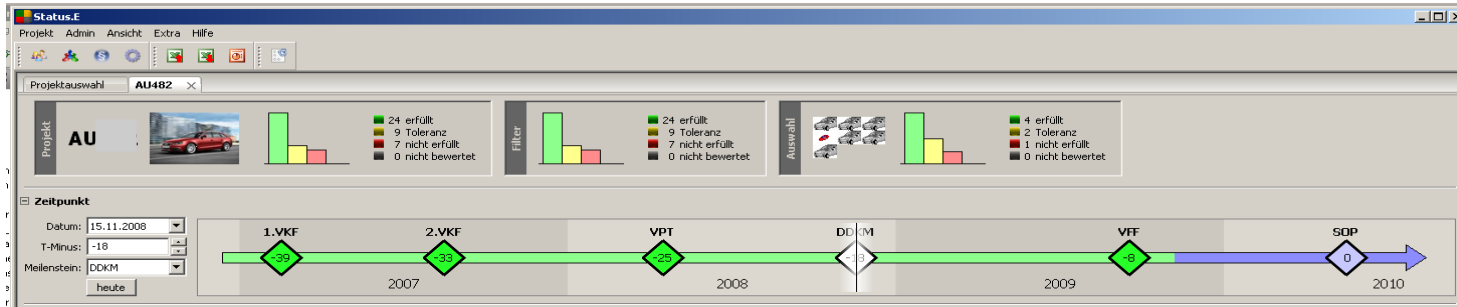
-33

-27

P
E
P

-18

Data Evaluation

Project Monitoring & Reporting

- Aggregation of assessments within CAE- team/department

- Mapping on project mile stones

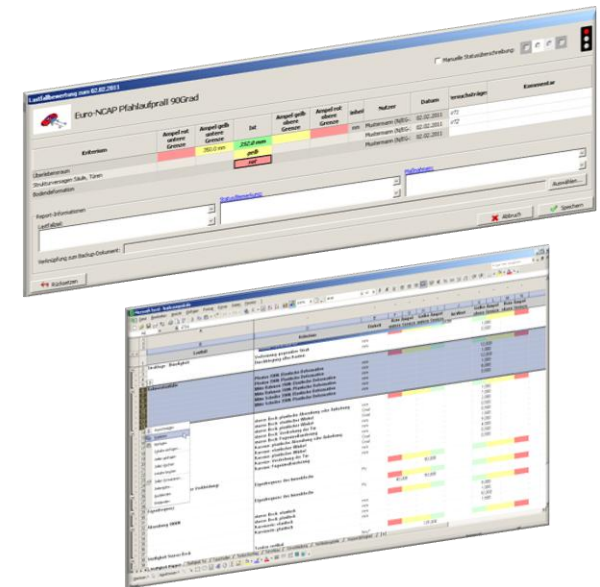- Monitoring of project status

- Report generation

Case Study 3: *Project- and Status Monitoring*

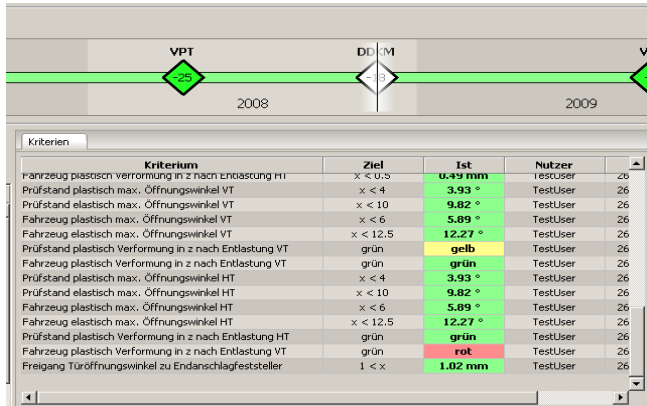■ **Monitoring – Project status at a milestone**

■ Temporal allocation of simulation and experimental results on milestones

■ Input of assessment data by

- ■ Interactive, GUI

- ■ Excel lists

- ■ Interfaces to other software applications

Case Study 3: *Project- and Status Monitoring*

■ **Assessment of a single status at a specific date**

■ **More features**

- Project Overview
  - Assessment of development state on demand
  - Who is responsible?
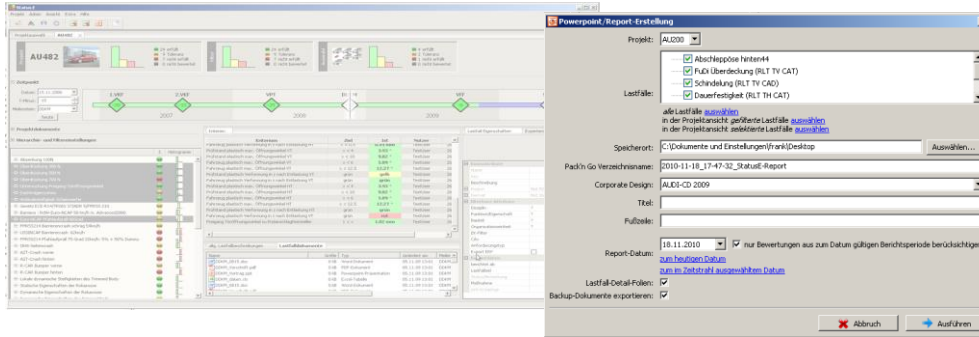 - Statistics (feasible/infeasible design properties)
- Rights management to secure visibility and modifications
- Identification of critical project situations, comparison of projects

Case Study 3: *Report Generation*
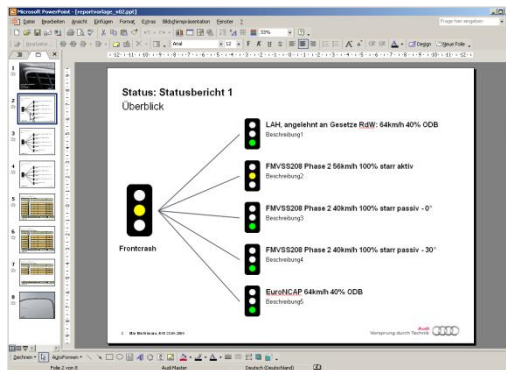
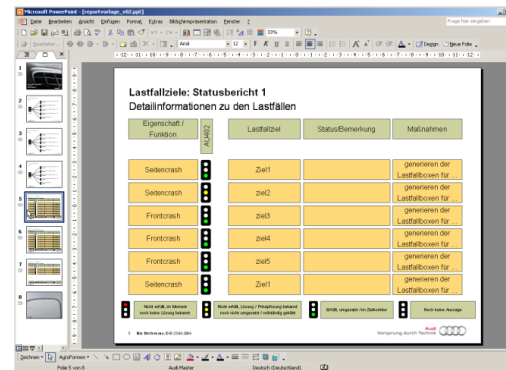## ■ Reporting – automated generation of *.ppt project reports

- Selection of scope and layout of reports

- Reports can contain links to more detailed information

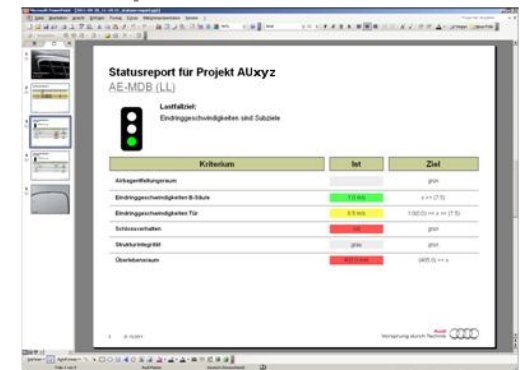- Integration of additional more detailed report documents

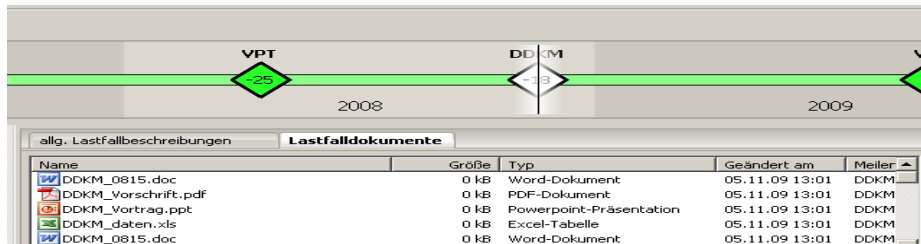**overview of assessment**

all load cases of a discipline

specific load case

Case Study 3: *Management of Documents*

- **Dedicated assessment documents and reports**
  - Attachment of documents to load cases, disciplines, projects

  - Allocation of final reports to mile stones

Summary

- Innovative software products increase efficiency, reliability and sustainability in the vehicle development

- Introduced software systems have been developed with AUDI and VW in very close cooperation with engineering departments

- Increasing acceptance for data and process management systems in simulation departments

Thanks for your attention!