Neue und geplante Entwicklungen in LoCo
Ausblick auf “Next Generation” (LoCo-X)

SCALE

Agenda

- Einführung LoCo
  - Einordnung in den Gesamtprozess
  - Features
  - Gemeinsames arbeiten über Standorte hinweg
  - Integration CAD, CAE, …
  - LiveDemo
- Weiterentwicklung SCALE Produkte
  - Entwicklung in Richtung eines integrierten Systems (CAx-Hub)
  - RichClient vs. WebApp
- Ausblick und aktueller Stand LoCoX - Entwicklung
  - GUI Konzepte
  - LoCoX Workshop
  - Live Demo

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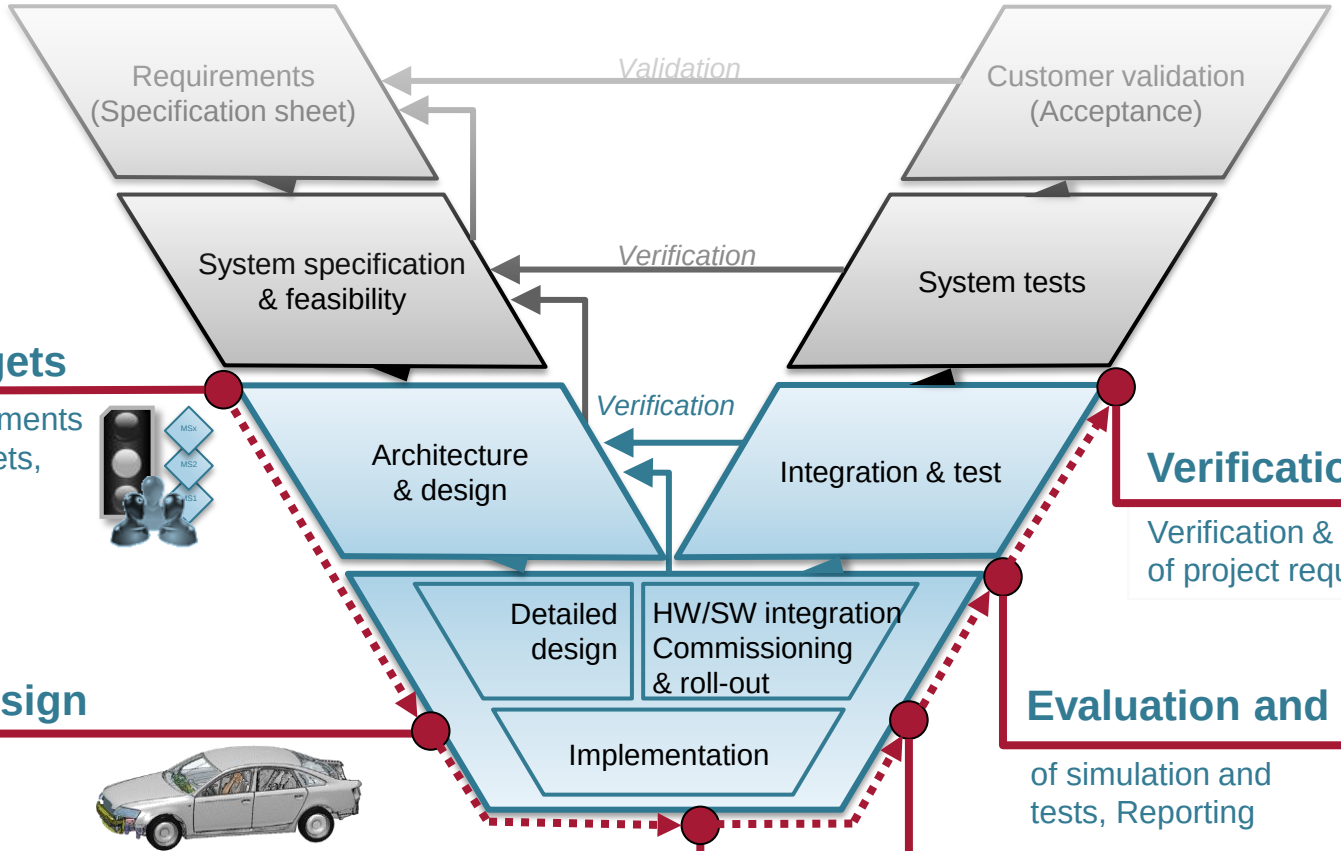
Introduction - Systems Engineering Process



Project targets

Setup of requirements and project targets, milestones and responsibilities

Verification

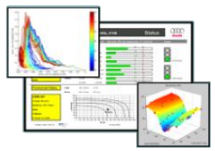
Verification & monitoring of project requirements

Detailed design

CAD / DMU

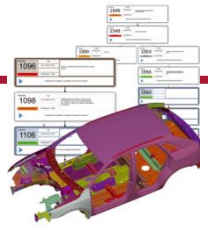
Evaluation and assessment

of simulation and tests, Reporting



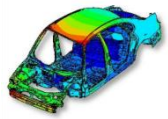
Implementation

Setup of simulation models and test prototypes



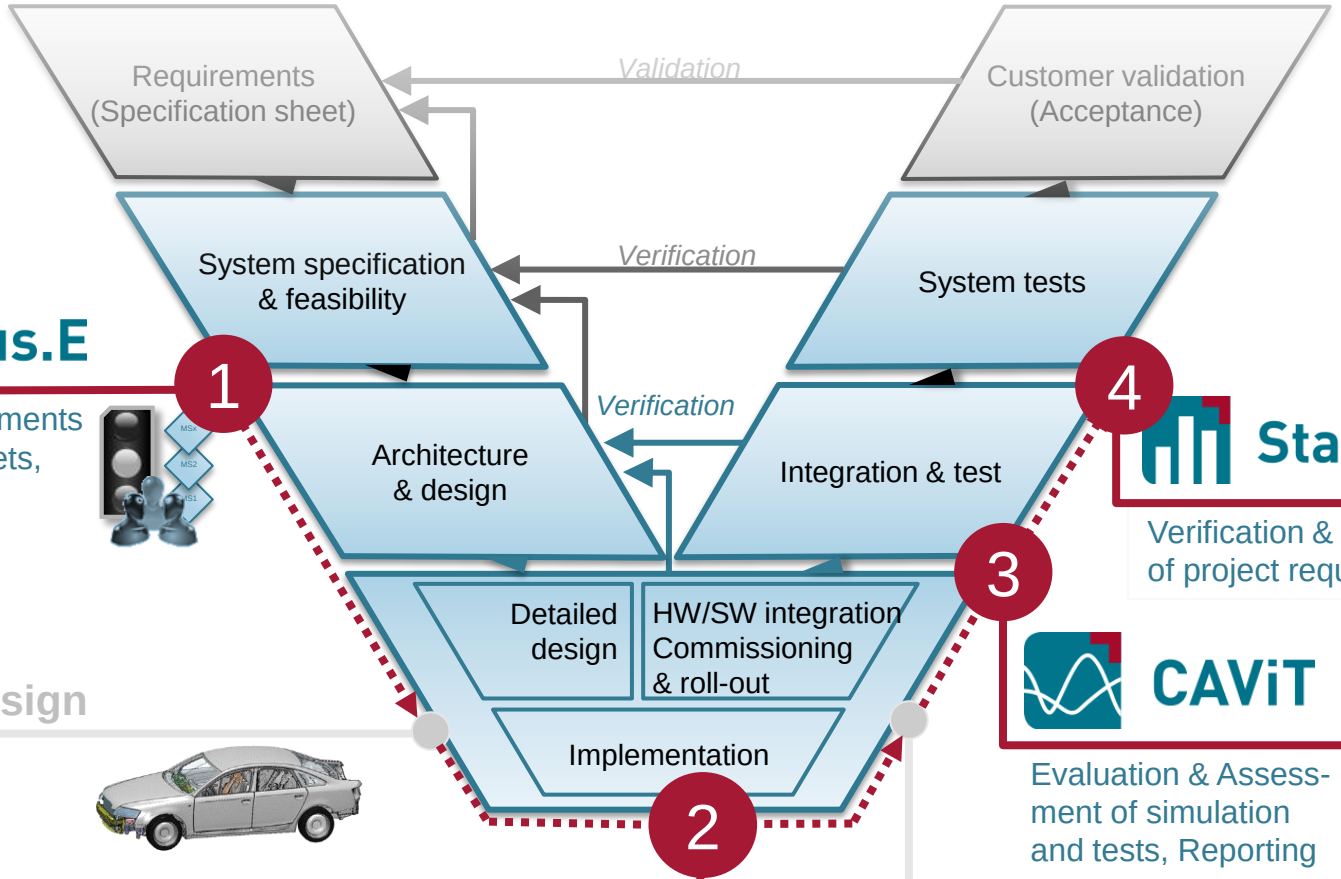
Solving / Testing

Perform simulation & test



SCALE

Introduction - Systems Engineering Process



Status.E

Setup of requirements and project targets, milestones and responsibilities

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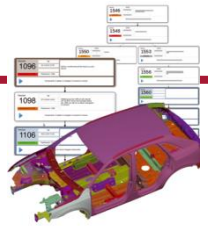
LoCo

Setup of simulation models



Status.E

Verification & monitoring of project requirements

CAViT

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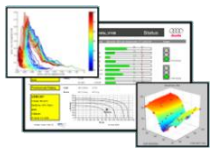

Solving / Testing

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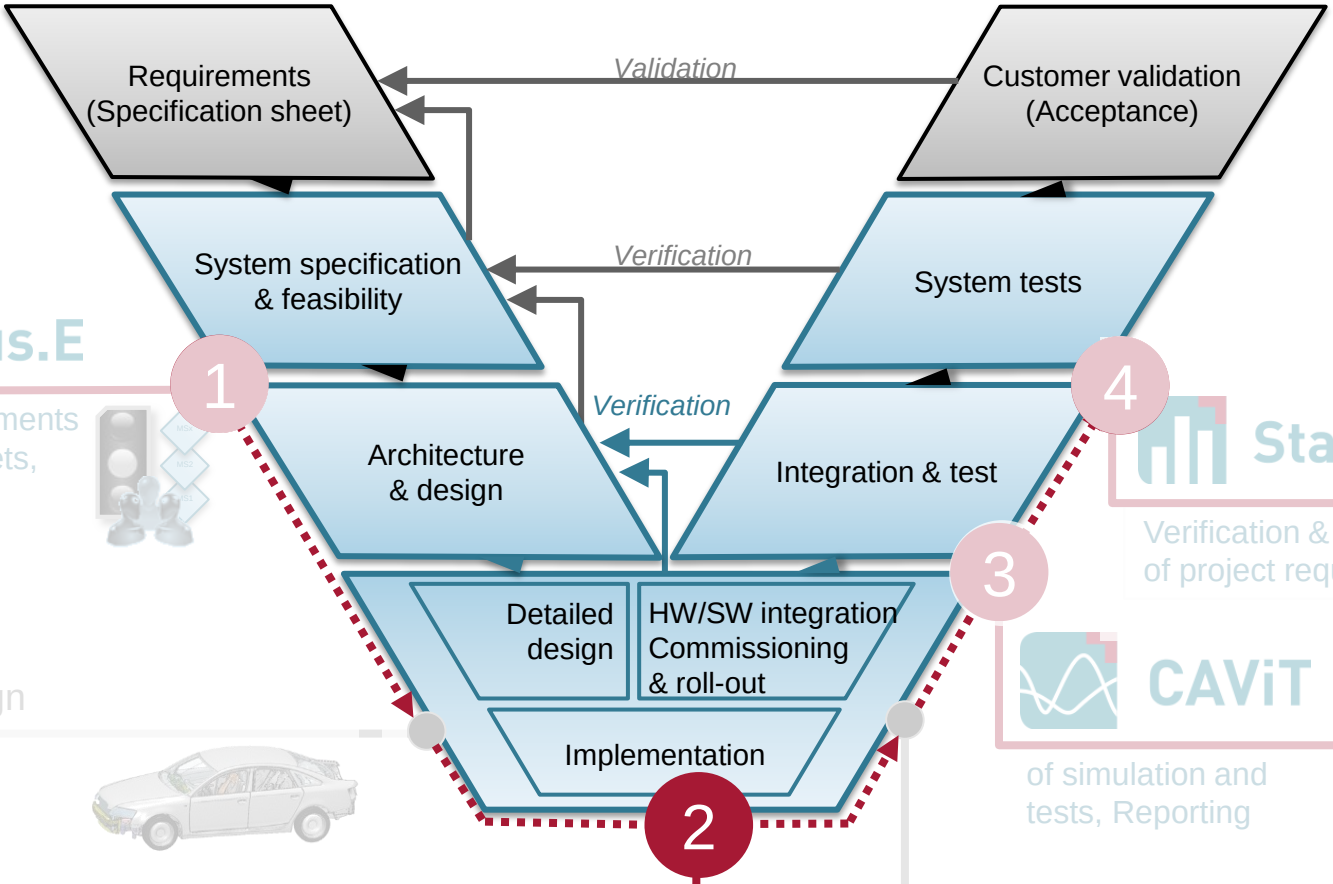
SCALE

Systems Engineering Process



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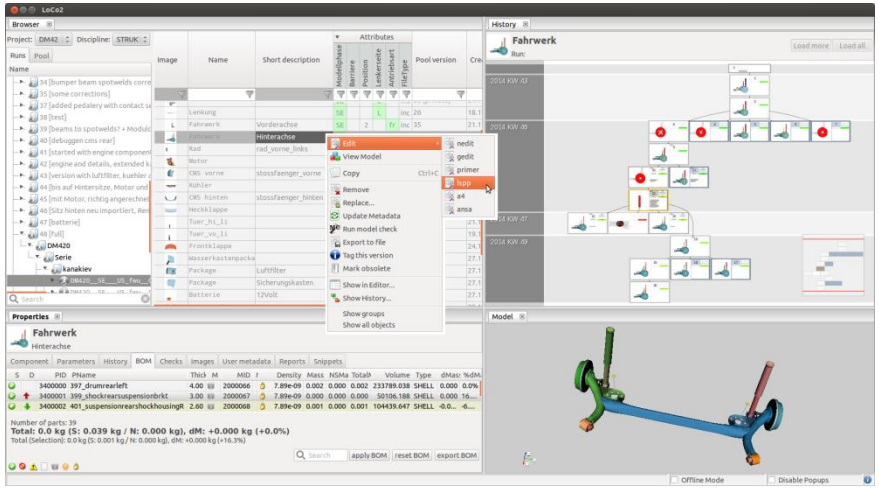
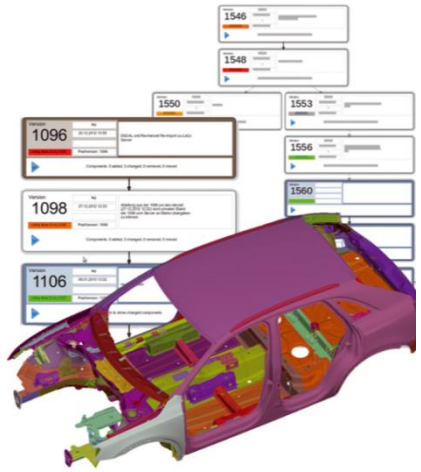
LoCo: Simulation Process and Data Management





Characterization

- **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, ...
  - Data and version management
  - History tracking
  - Job submit and monitoring
  - Quality checks of models
  - Advanced security features
    - Two factor authentication
    - Encryption
  - Distributed, collaborative work environment
  - Access-, roles and rights management
  - Optimization, robustness, DOE, ...
  - ...

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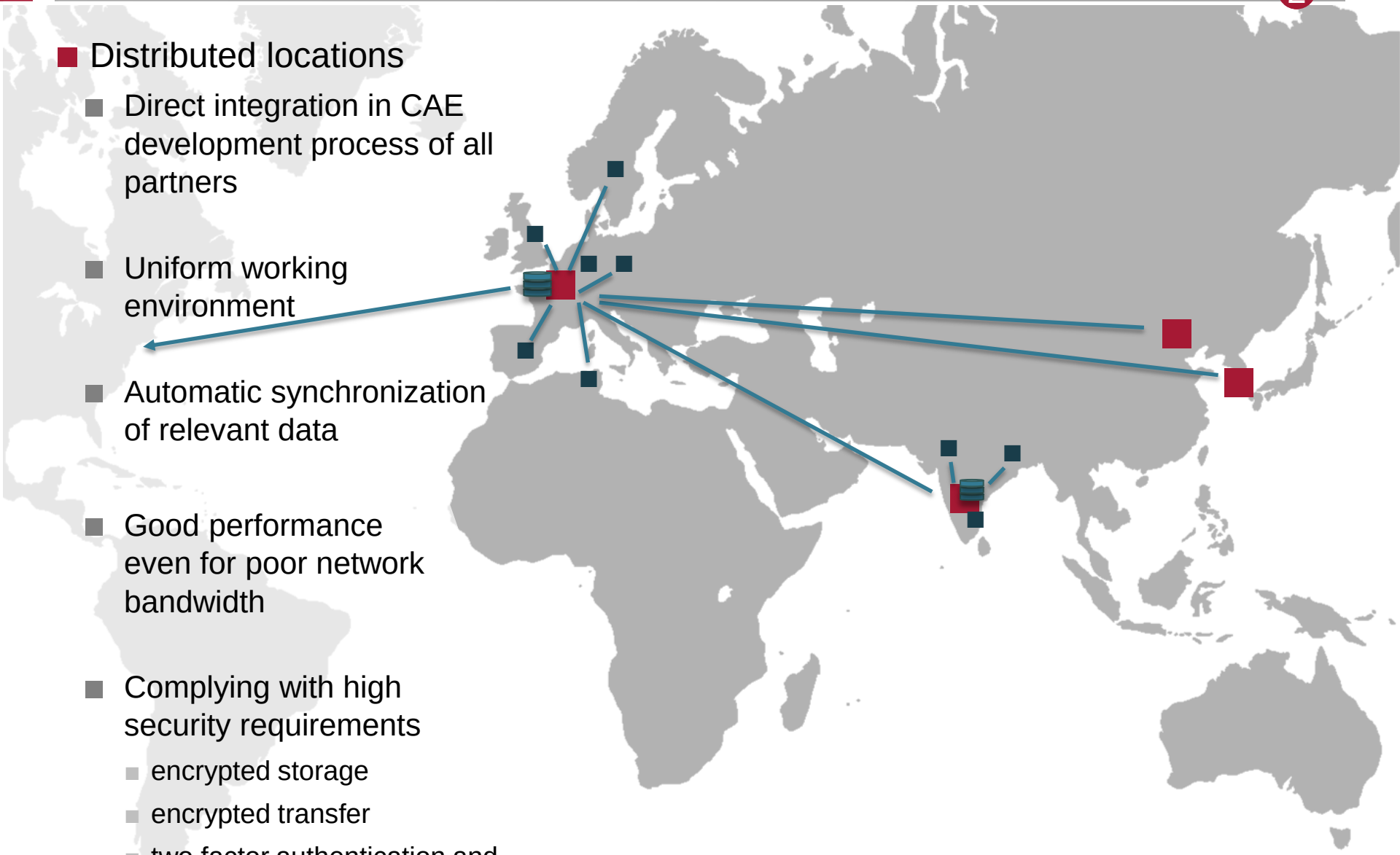
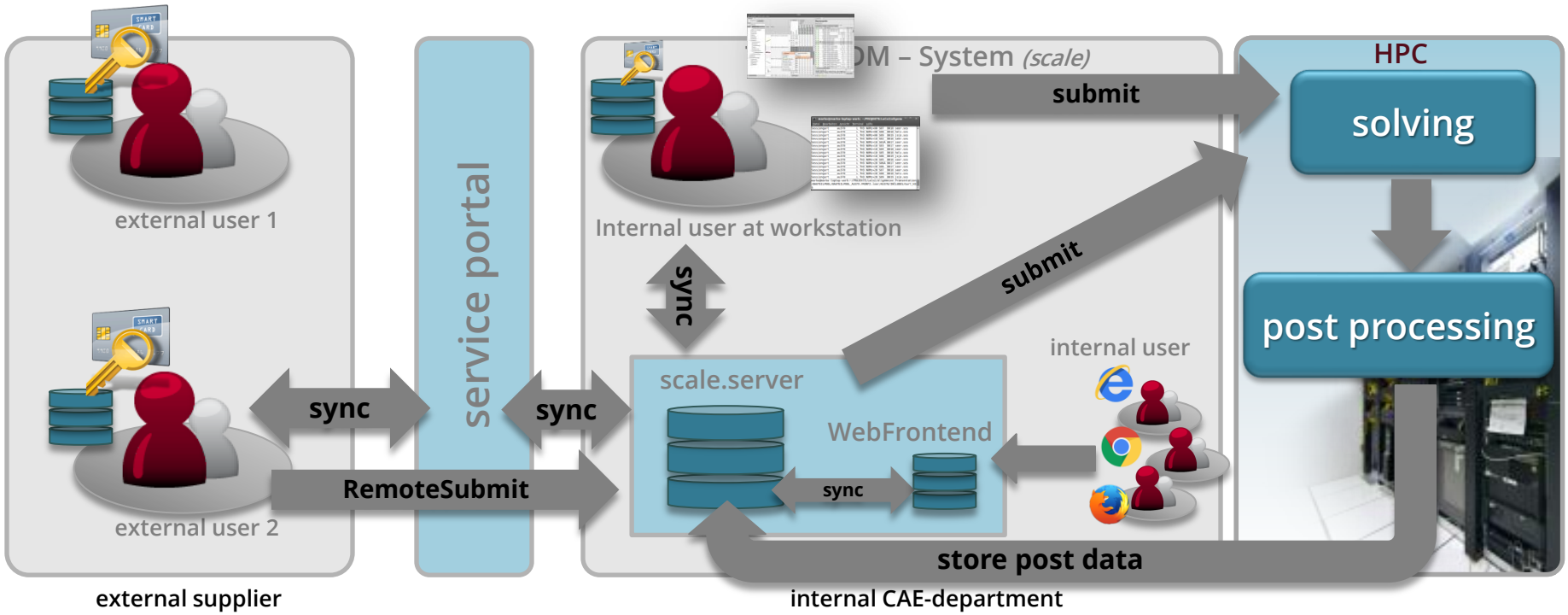
LoCo: scaling development by decentralization

- Distributed locations
  - Direct integration in CAE development process of all partners
  - Uniform working environment
  - Automatic synchronization of relevant data
  - Good performance even for poor network bandwidth
  - Complying with high security requirements
    - encrypted storage
    - encrypted transfer
    - two factor authentication and encryption



LoCo: Workflow, Teamwork and Synchronization



Sync
decentralized

- Central data storage, synchronization with local workstations *(cloud like infrastructure)*
- Encrypted transfer, encrypted storage *(two factor authentication and encryption)*
- Offline handling of data *(RichClient)*

Offline / Online
performance

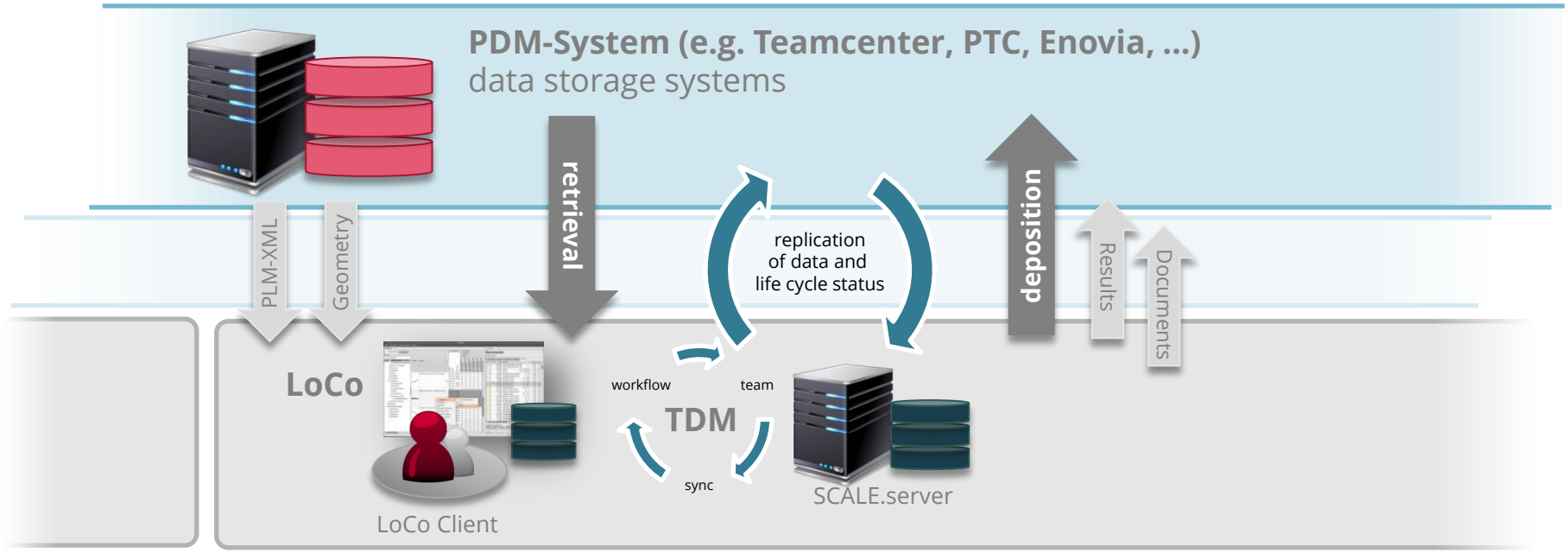
- Users/Teams are independent of servers and infrastructure
- Users work with local data
- Good performance while application of preprocessing tools

Integration

- **Integration with existing PDM Infrastructure as TDM-System** *(Team Data Management)*

SCALE

LoCo: Integration with PDM Systemen



- Automated / integrated data deposition and retrieval from connected Storage and PDM-Systems
  - Automatic deposition of important variants from LoCo
  - Easy retrieval of stored variants
  - Usage of system APIs for access
- Automatic cleanup: storage space in SCALE.server might be restricted *(by time, size and/or usage)*
- Replication of life cycle status *(reference, status, ...)*

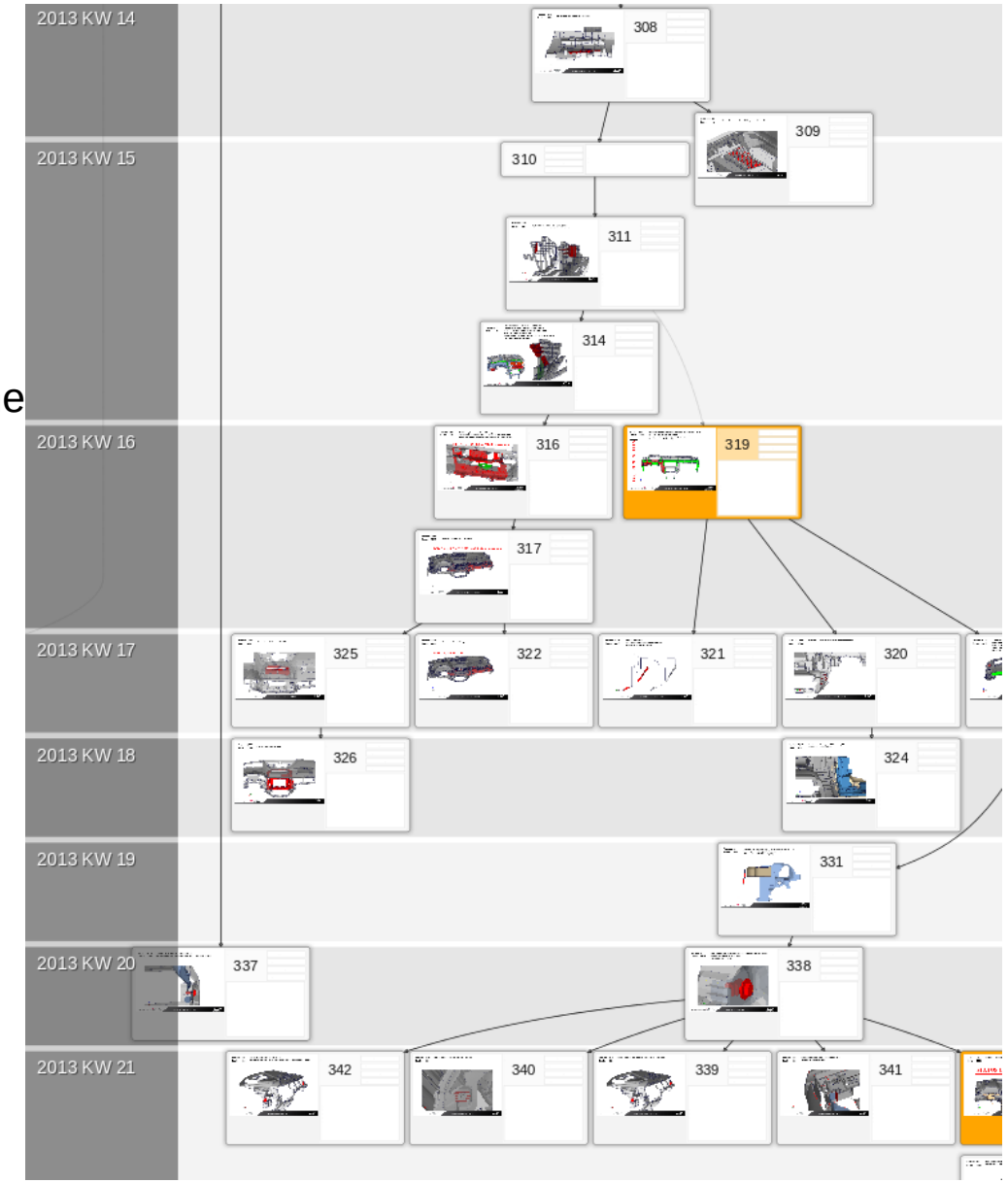
LoCo: Version Control

- Version control is the management of changes to data

- Motivation:
  - Simulation is change driven
  - Changes need to be documented
  - Engineers need to work on the same

- In LoCo **every** object is versioned

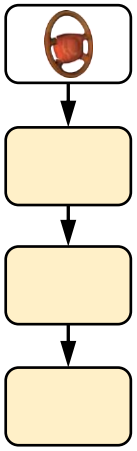
Simulation Runs
Scripts **Modules** Folders
Meshes Parameters



LoCo: Version control

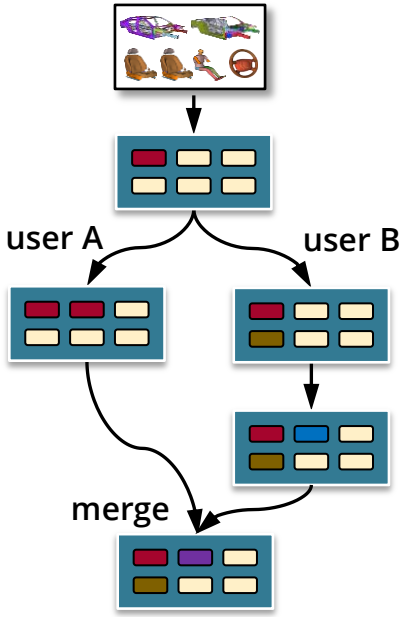
- „Lock Modify Write“ *(classical PDM Systems)*
  - Components are first locked, then modified and finally unlocked again
  - After the work is done users need to check in changed items
  - While the component is locked, other users are prevented from modifying the same component
  - Users may have to wait
  - Easy to understand
  - Always consistent data *(no merging of data required)*

Meshing

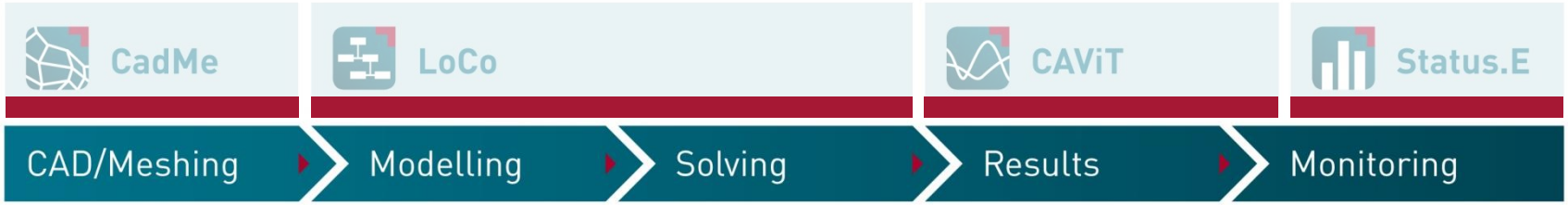


- „Copy Modify Merge“ *(LoCo, git, svn, ...)*
  - Objects can be used instantly *(on changes a copy will be created)*
  - No „check in“ – „check out“ necessary
  - Each user works with a complete independent copy of all data
  - Simultaneous work on the same objects is possible
  - At some point different “branches” need to be merged

LoCo



Example CAE Workflow



- Import from PDM
- Manage geometries
- Integrate meshing tools
- Mange meshes for different solvers

- Setup models
- Integrate simulation processes
- Share model data
- Run simulations

- Browse simulation results
- Access results with postprocessors
- Run reports and evaluations

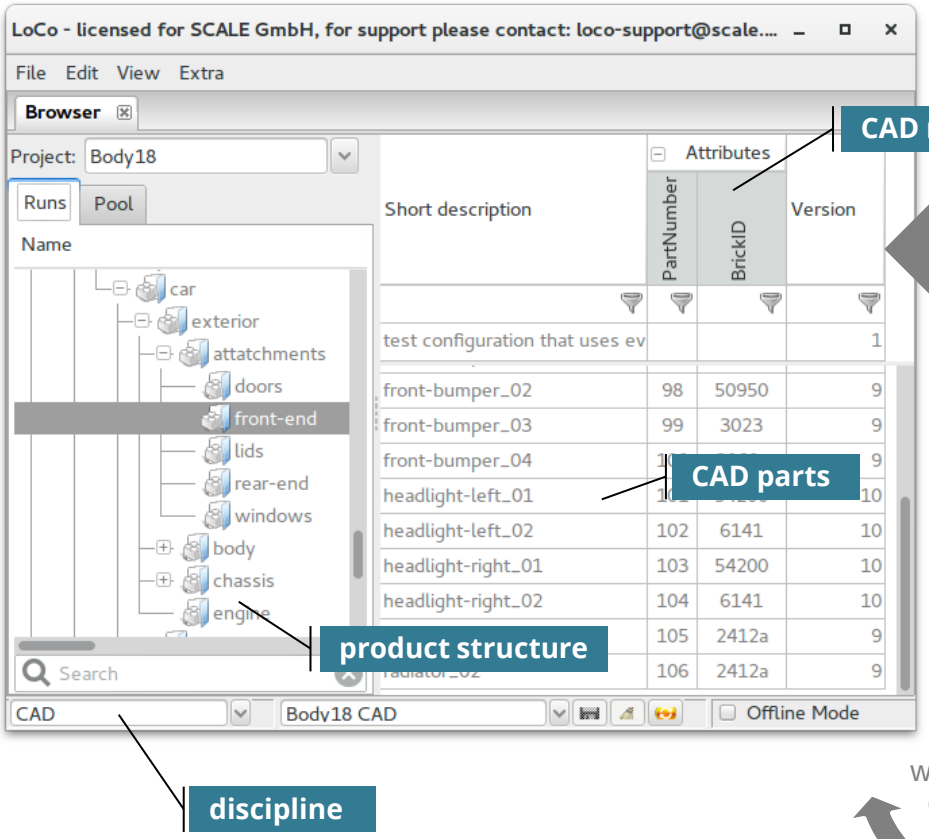
- Monitor results over time
- Evaluate and Report project status

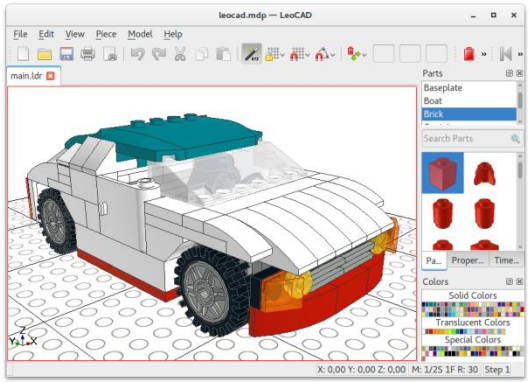
SCALE

SDM Workflow and Process control

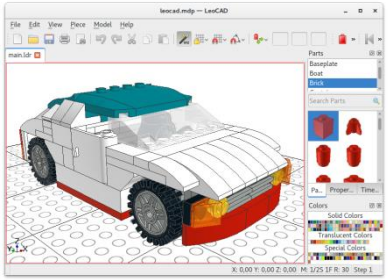
Importing CAD Data

PDM/CAD System



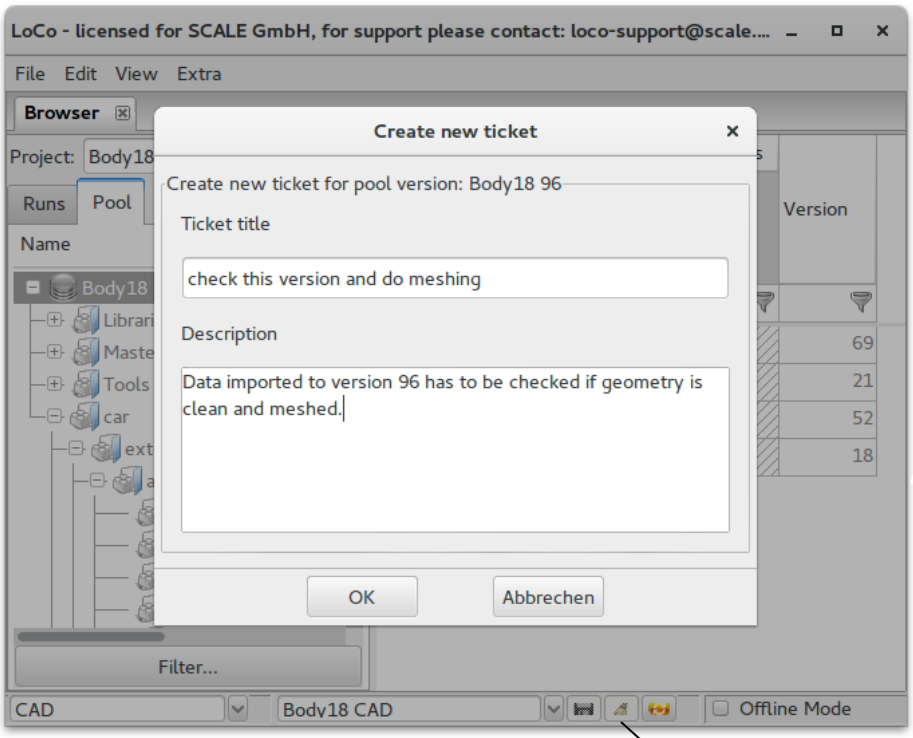


working with CAD data



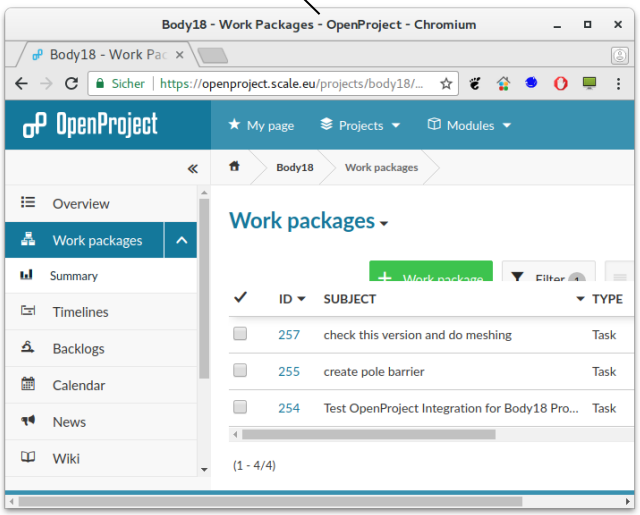
SDM Workflow and Process control

Creating a task for meshing



Tasks are managed in project management system

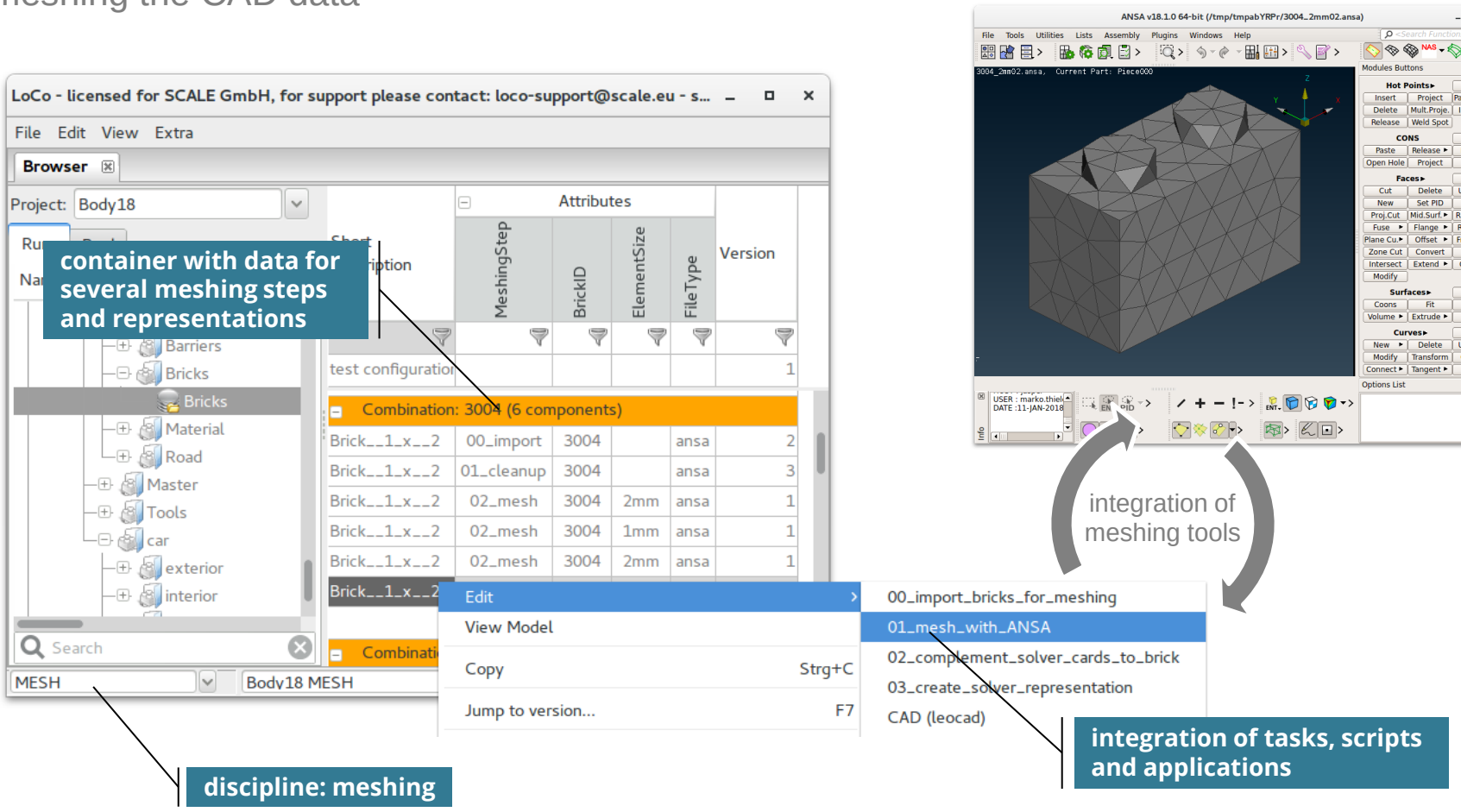
Integration with project management system



create new tasks related to data

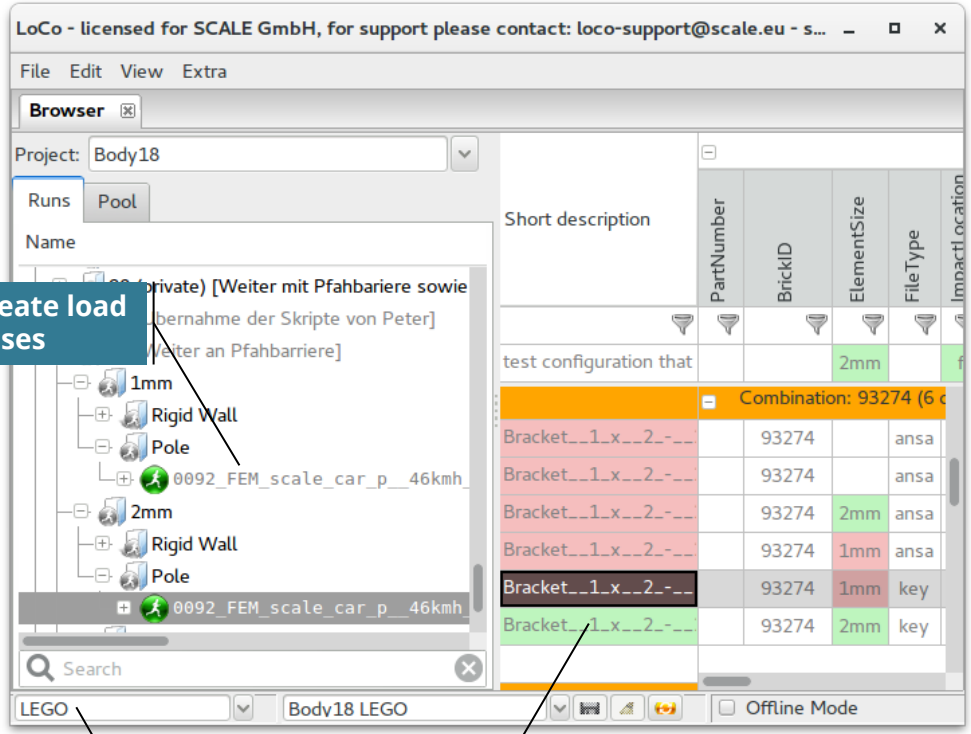
SDM Workflow and Process control

meshing the CAD data



SDM Workflow and Process control

deliver meshing results

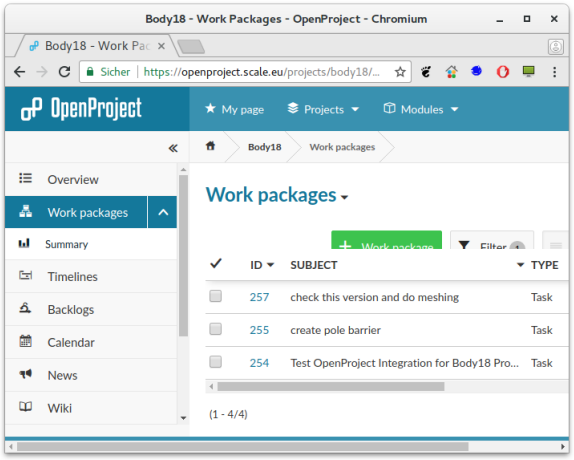


create load cases

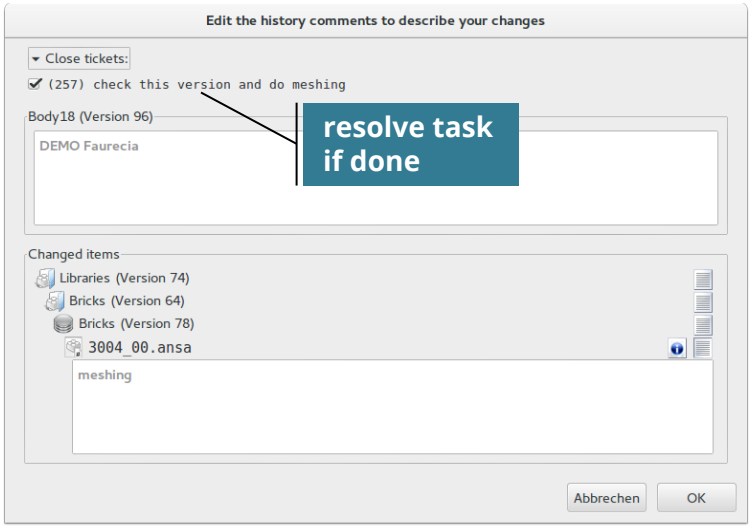
discipline: FEM

create solver representations

set data public



notification through project management system

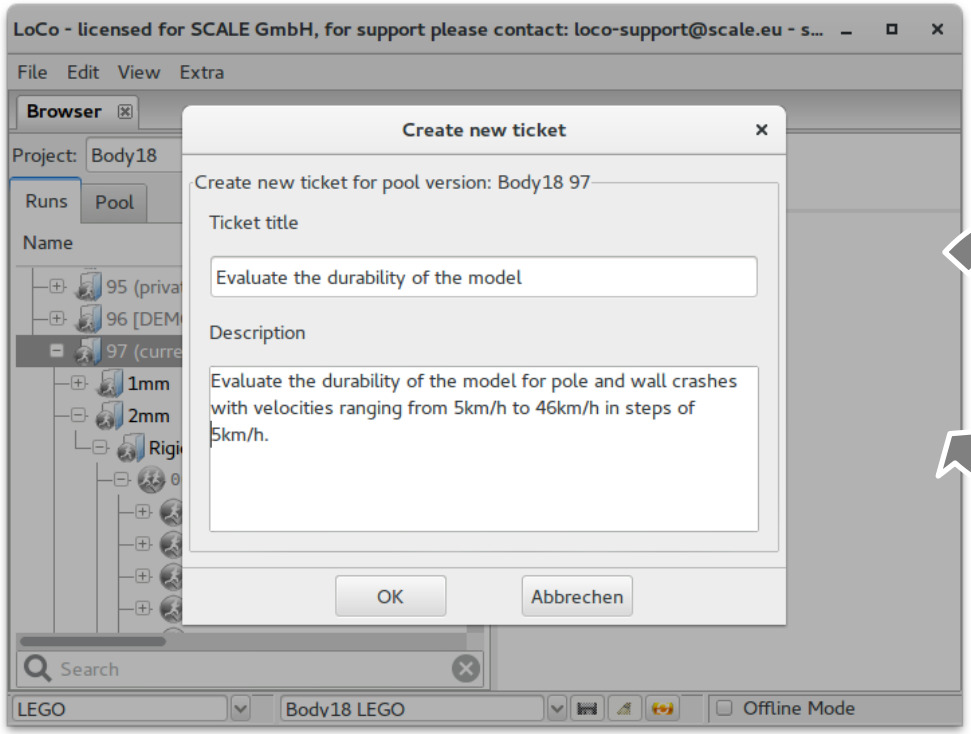


resolve task if done

SCALE

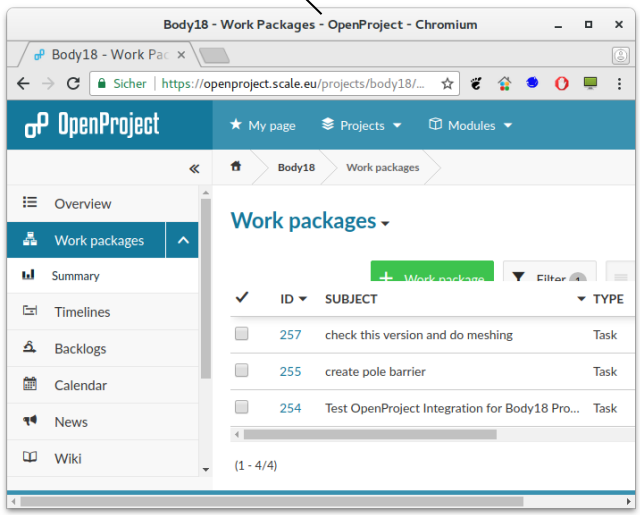
SDM Workflow and Process control

creating a task for simulation



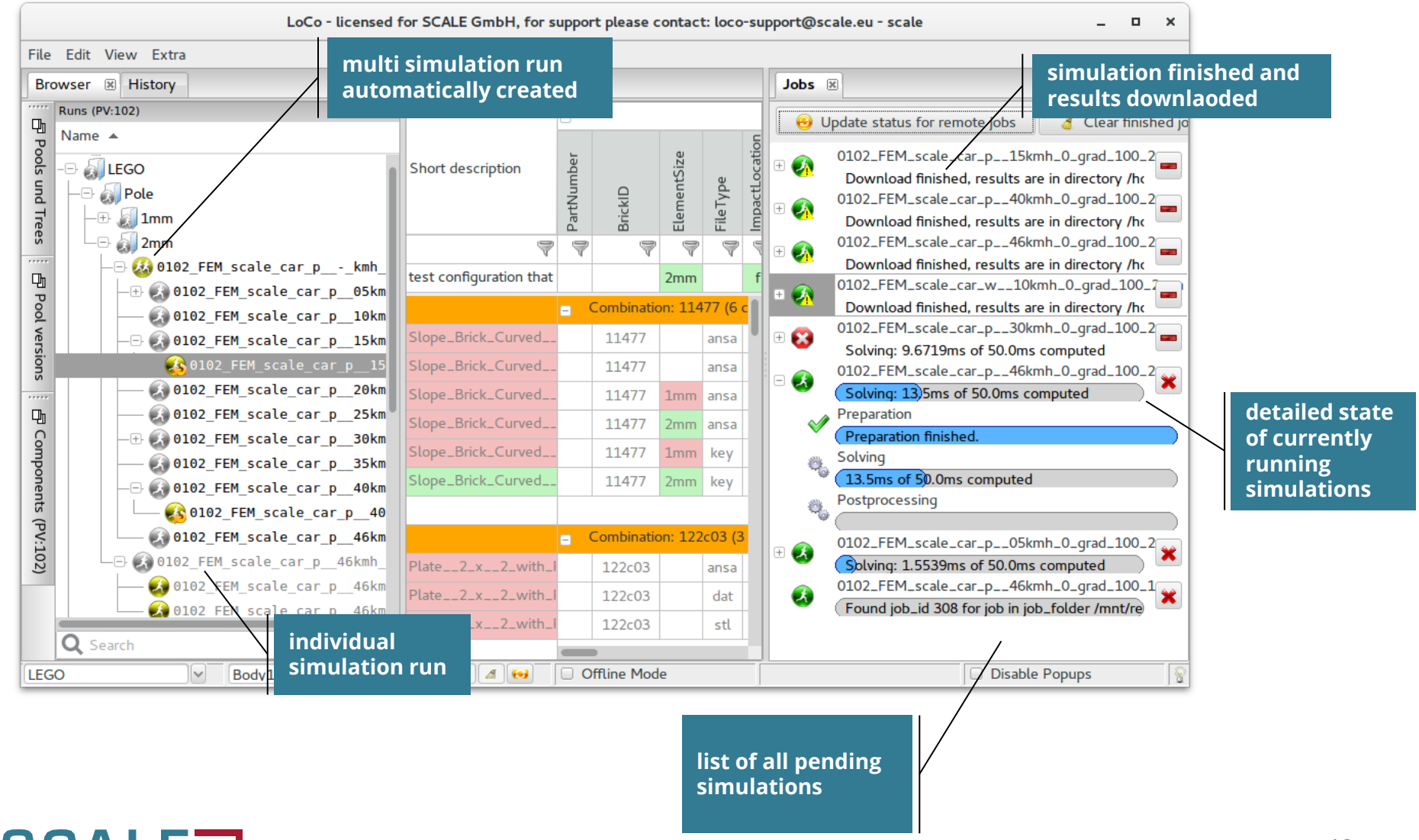
Tasks are managed in project management system

Integration with project management system



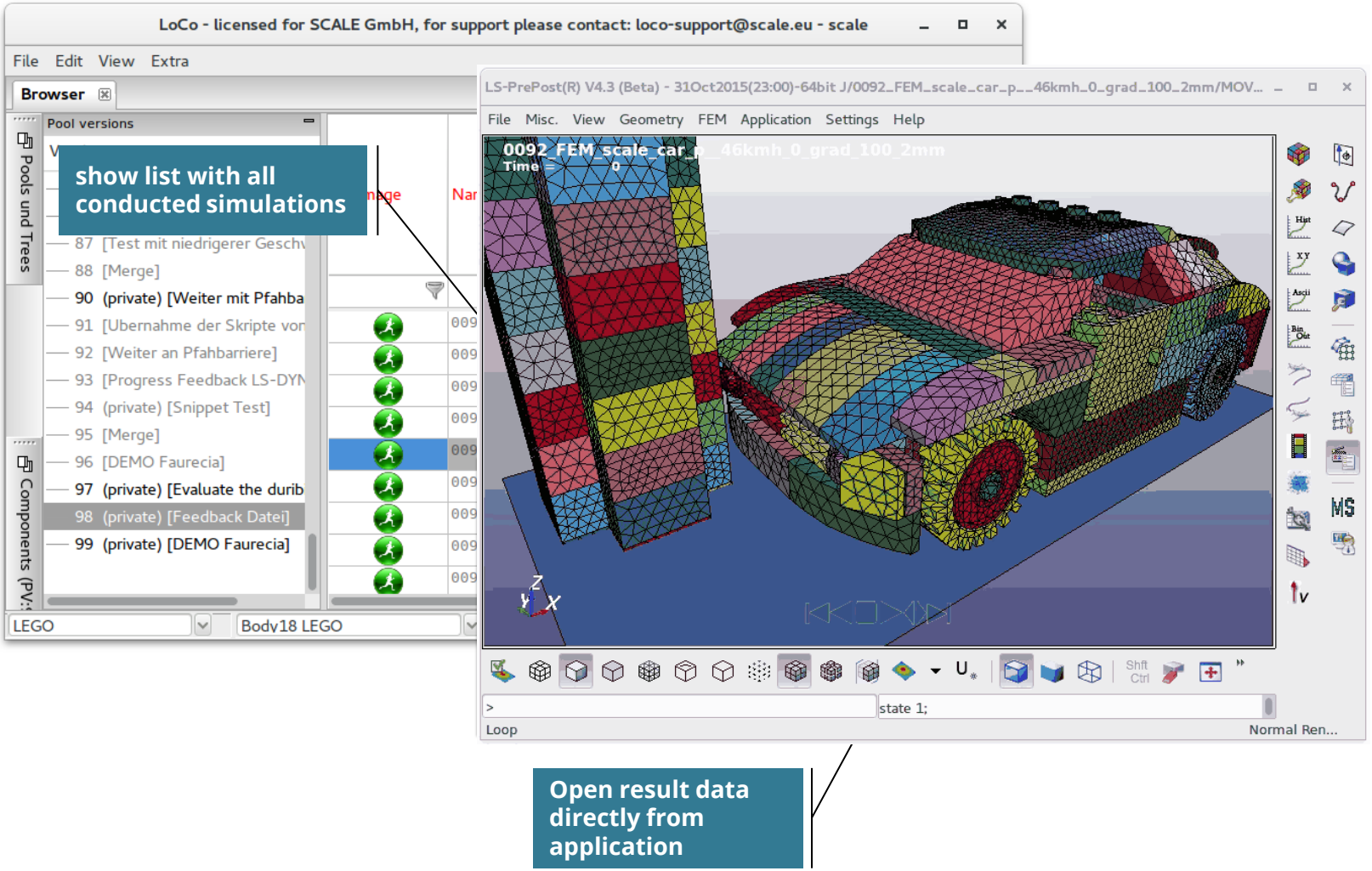
SDM Workflow and Process control

Submitting simulation jobs



SDM Workflow and Process control

access to results

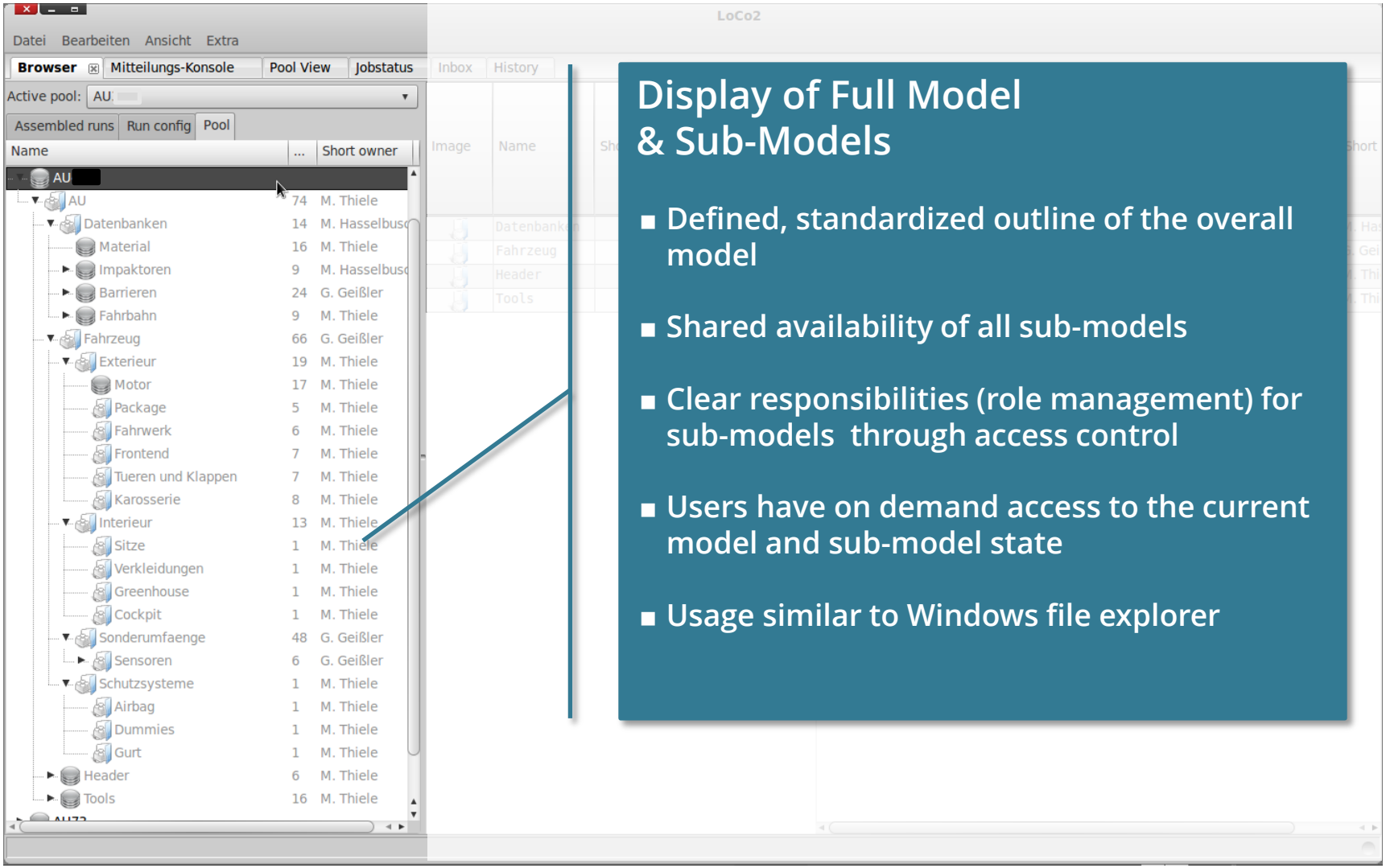


SDM Workflow and Process control

look and feel…

Live Demo LoCo2

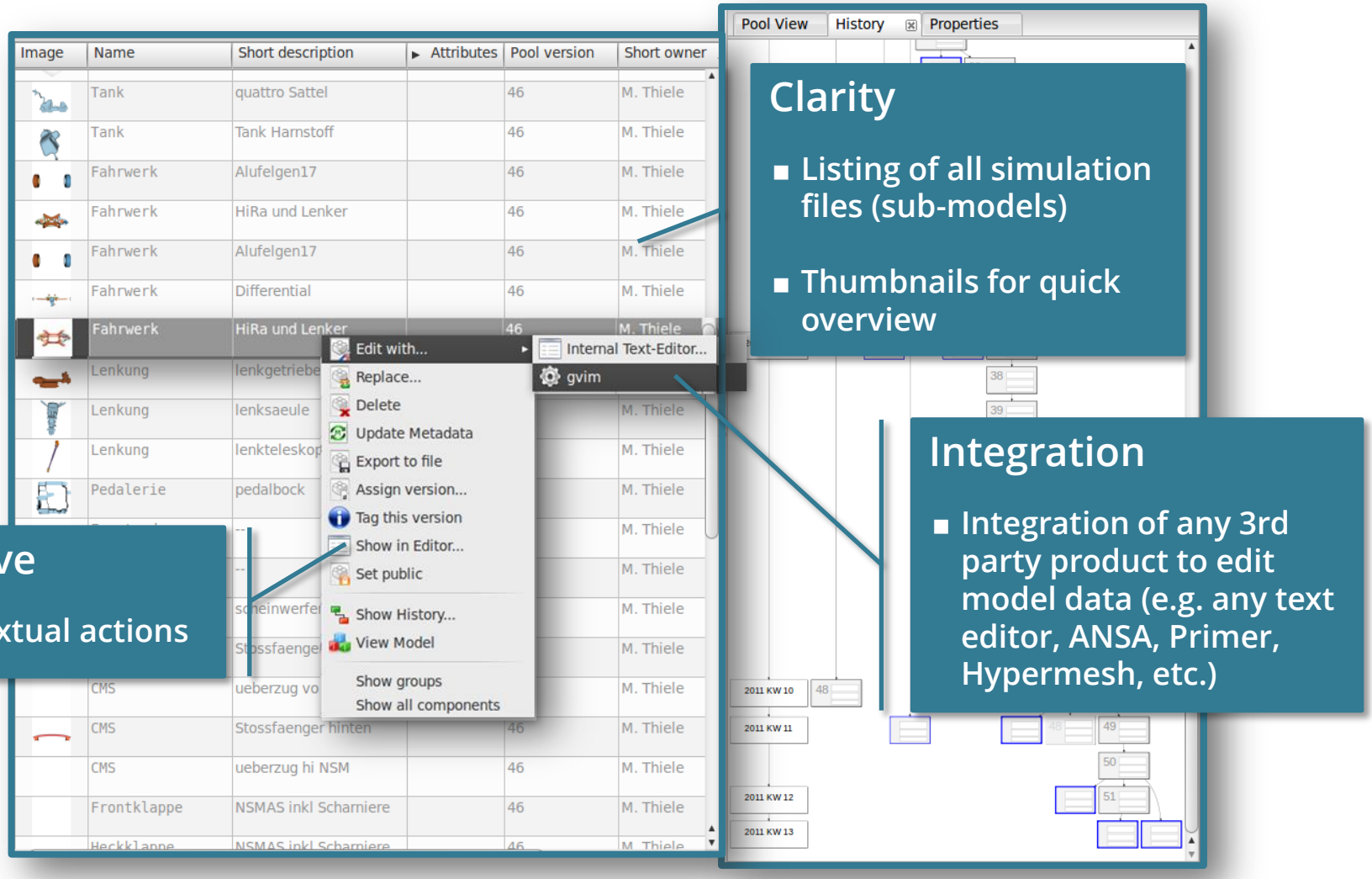
LoCo: Workbench for Simulation Engineers



Display of Full Model & Sub-Models

- Defined, standardized outline of the overall model
- Shared availability of all sub-models
- Clear responsibilities (role management) for sub-models through access control
- Users have on demand access to the current model and sub-model state
- Usage similar to Windows file explorer

LoCo: Workbench for Simulation Engineers



Clarity

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

Integration

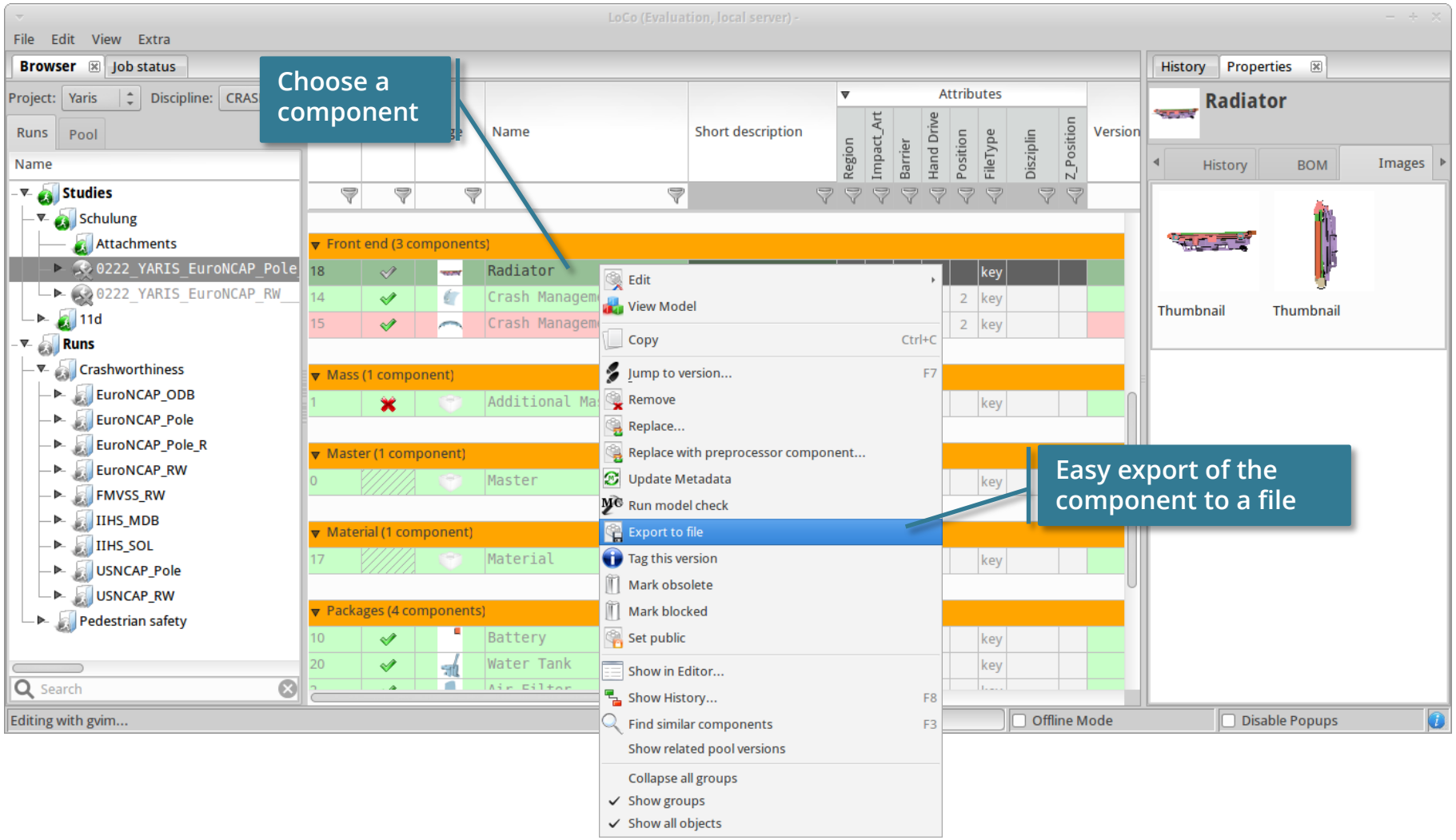
- Integration of any 3rd party product to edit model data (e.g. any text editor, ANSA, Primer, Hypermesh, etc.)

Intuitive

- Contextual actions

SCALE

LoCo: Workbench for Simulation Engineers



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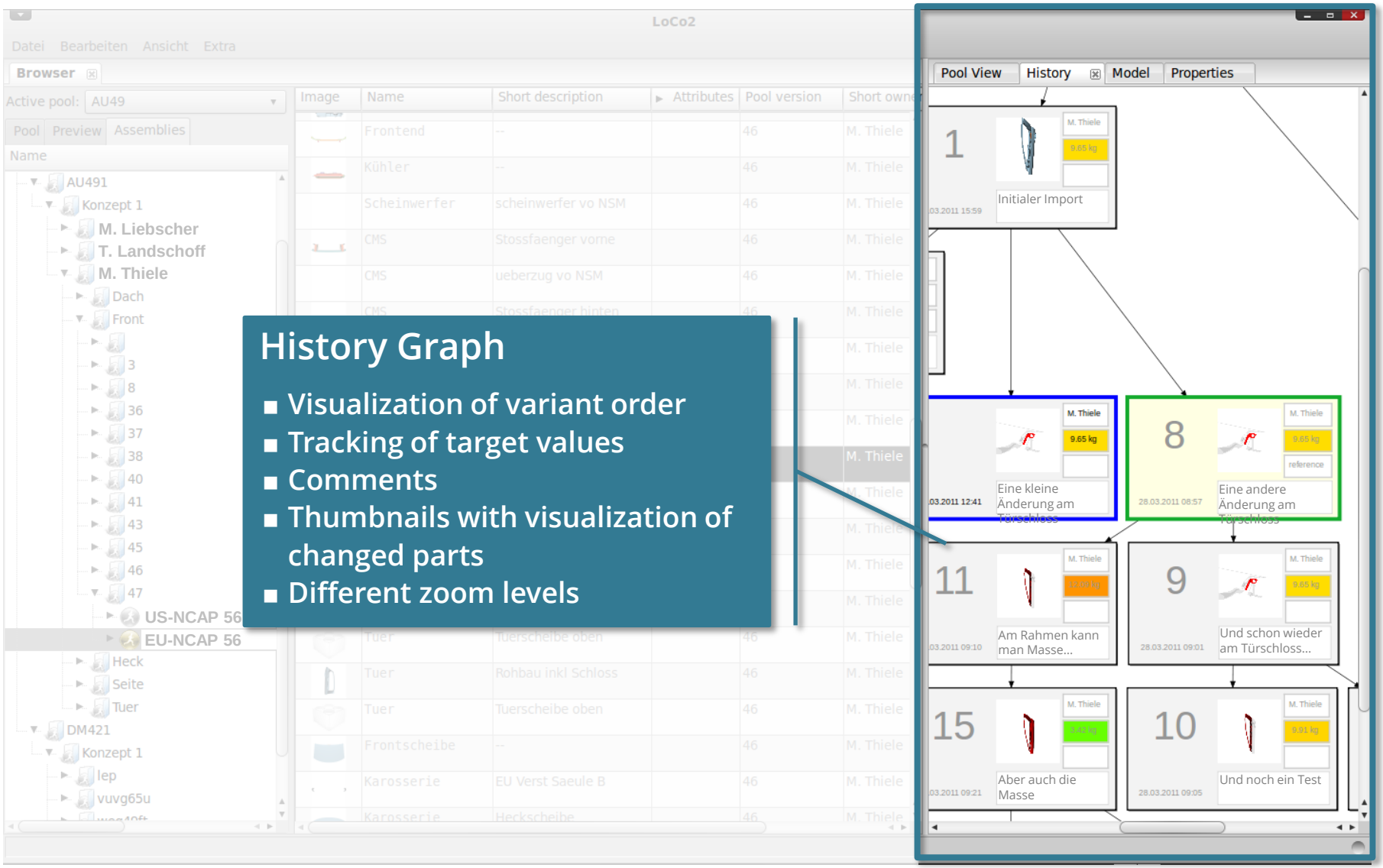
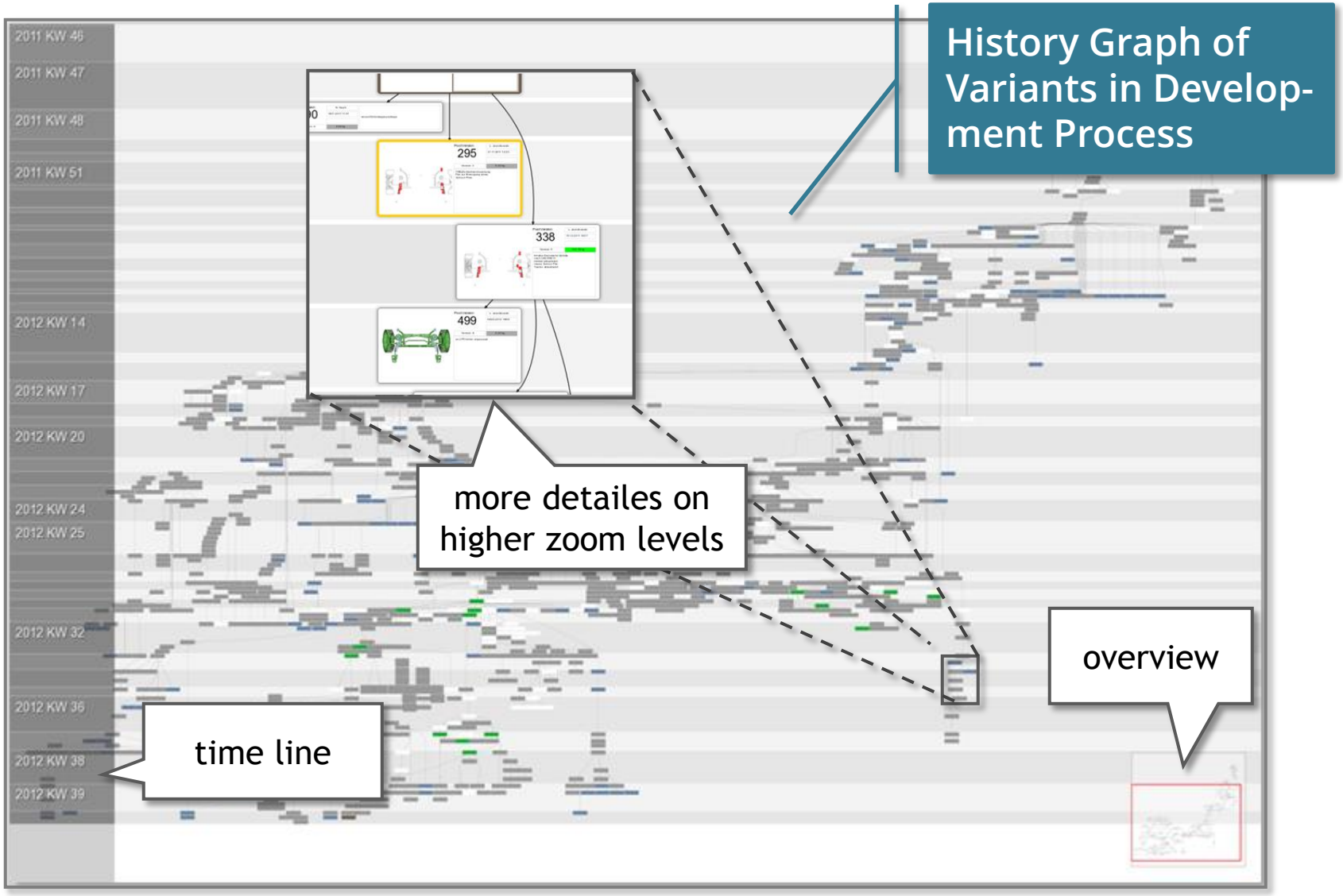


History Graph

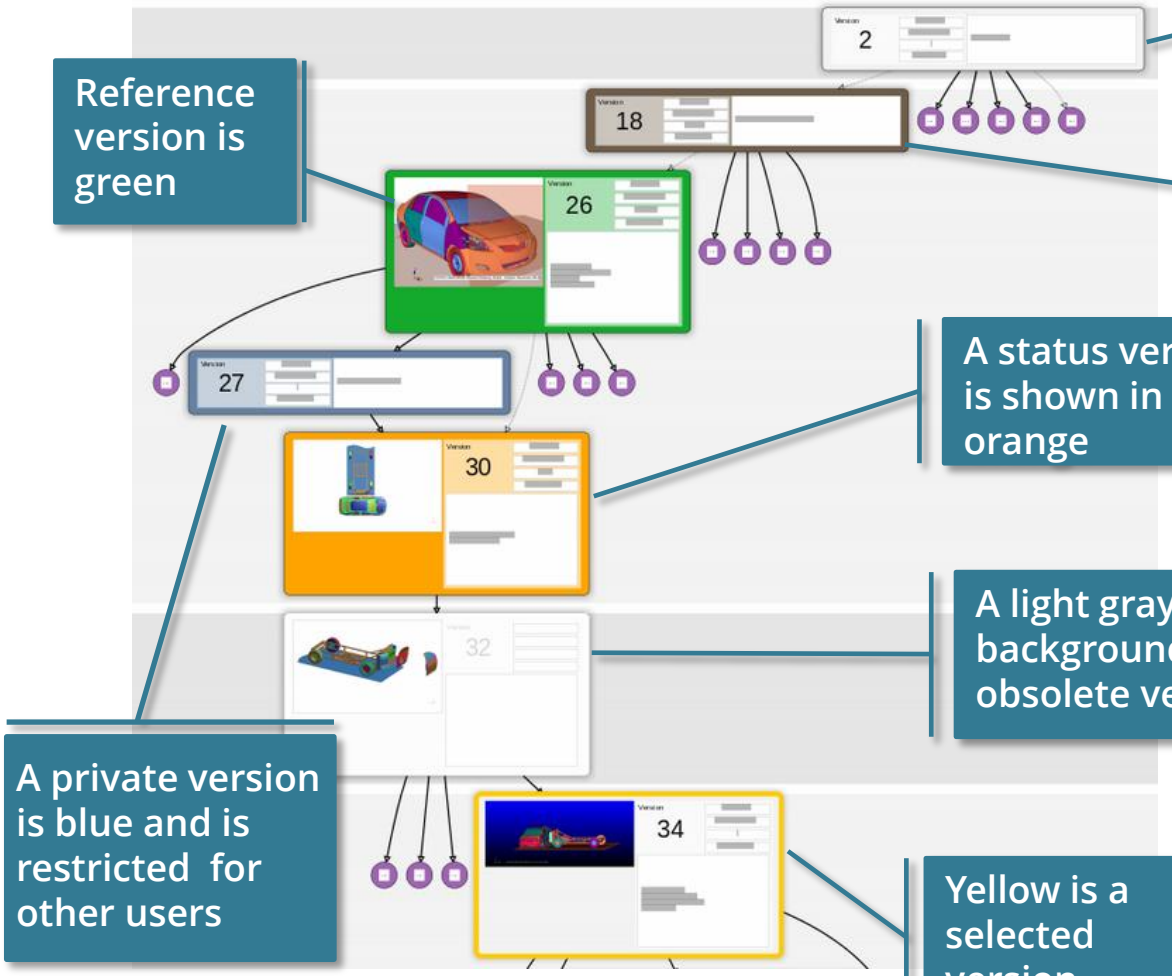
- Visualization of variant order
- Tracking of target values
- Comments
- Thumbnails with visualization of changed parts
- Different zoom levels

LoCo: Workbench for Simulation Engineers



LoCo: Workbench for Simulation Engineers

History Graph – Meaning of Colors



White background is a released ("public") version

Reference version is green

Dark background is the current working version

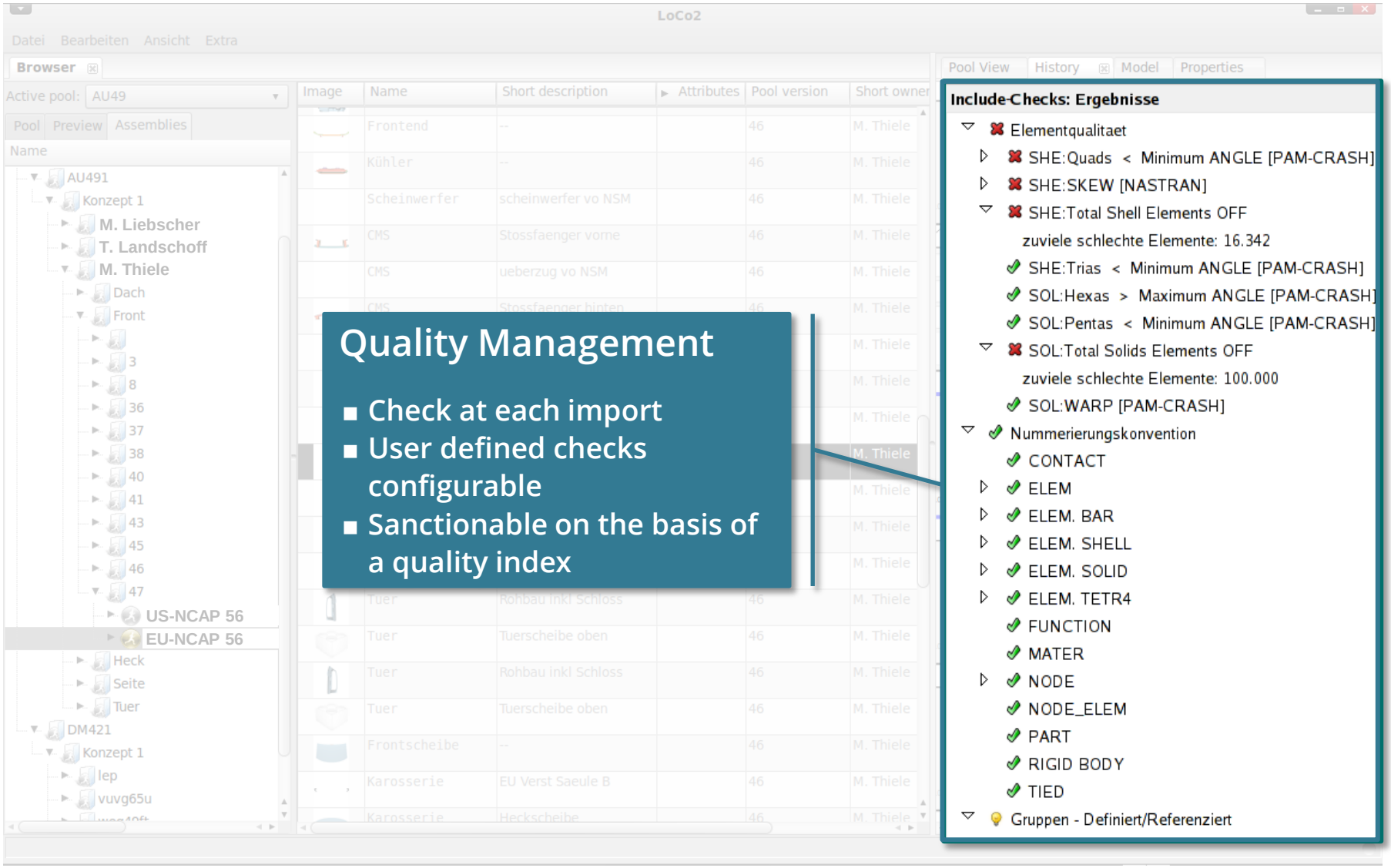
A status version is shown in orange

A light gray background is an obsolete version

A private version is blue and is restricted for other users

Yellow is a selected version

LoCo: Workbench for Simulation Engineers

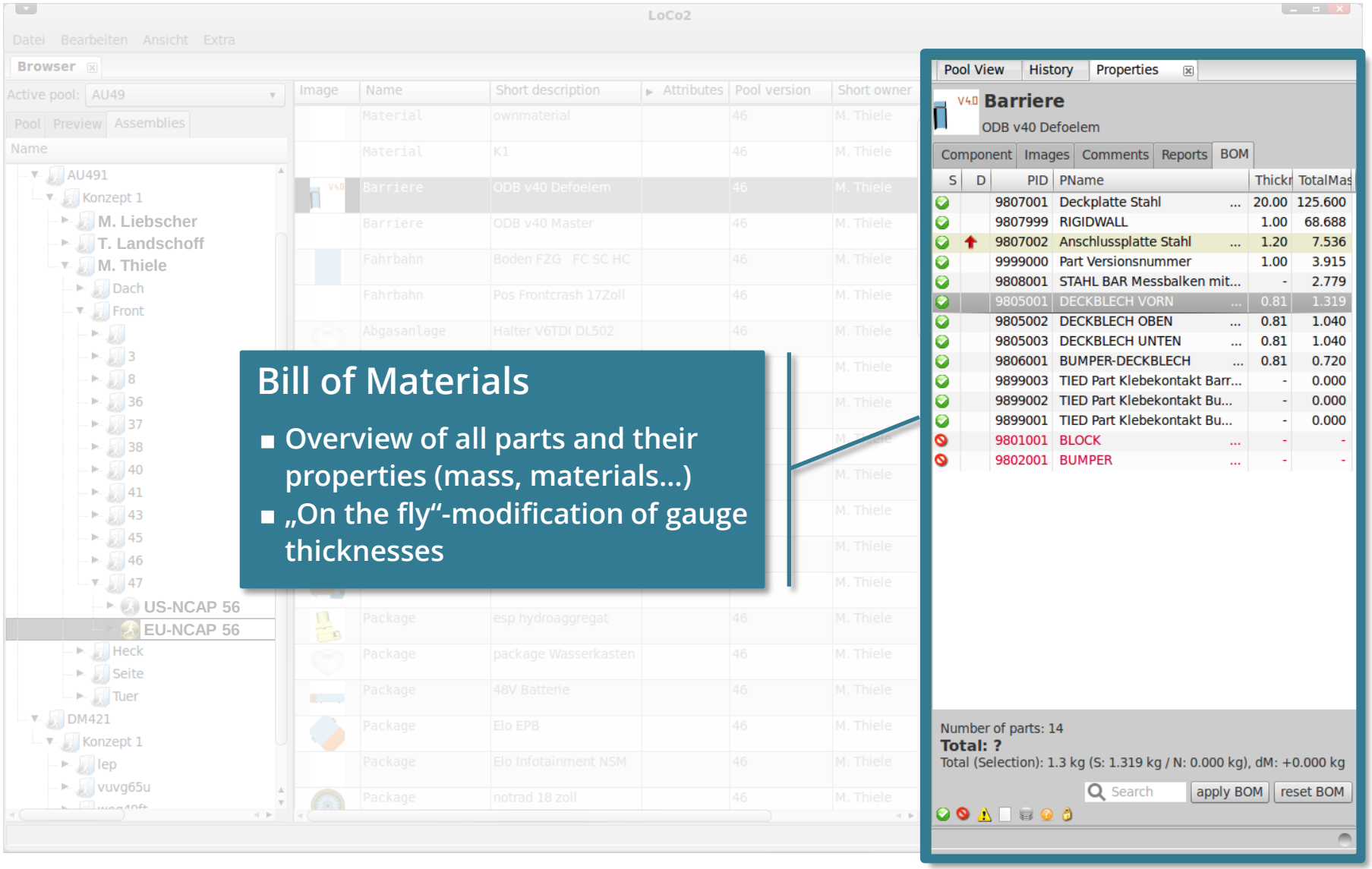


Quality Management

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

SCALE

LoCo: Workbench for Simulation Engineers

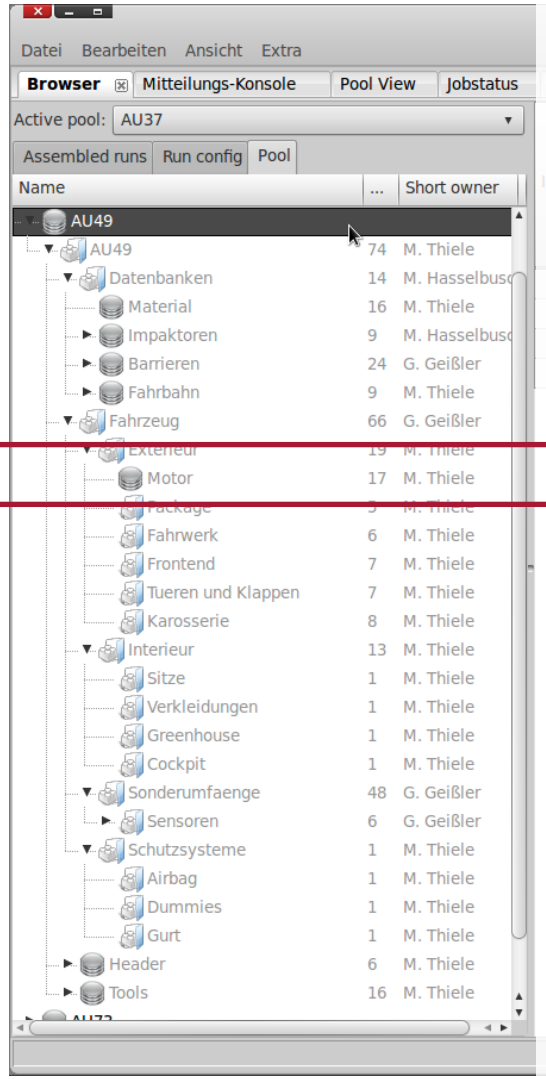


Bill of Materials

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

SCALE

LoCo: Component Management / Modeling Aspects



- **Homogeneity:** Common components wherever possible
- **Libraries:** Direct access and integration
  - Materials
  - Barriers
  - Impactors
  - Engines
  - Dummies
  - ...
- **Access Control:** Not everybody can edit any component *(e.g. materials)*
- **Uniform structure for all projects**

LoCo: Submitting and monitoring of jobs

Job Submit

Instant start of jobs on the HPC-cluster

- Models are assembled directly in the datacenter at the HPC-cluster
- A minimum of data has to be transferred
- Jobs start instantly

Job Control

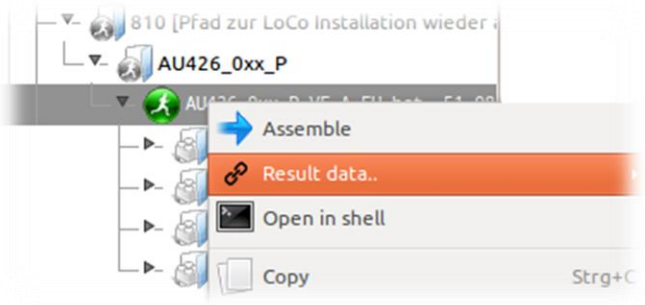
Monitoring job progress on the HPC-cluster

- Continuous feedback on job progress
- Stopping of jobs

Result Access

Retrieving and accessing result data

- Automatic download of result data
- Access to result data of other users
- Direct integration with post processors



Recent and upcoming Development current LoCo2

- VAVID: Data Deduplication
  - Reduktion der Datenmengen um ca. Faktor 6-8
  - Vollständig für Datenablage und Transfer implementiert und im Einsatz

- Löschregeln
  - Kunden können Regeln definieren ab wann Daten im System gelöscht werden sollen
  - z.B.: „Lösche alle Daten die mehr als 5 Jahre nicht mehr verwendet worden sind“

- StagedTree Navigation
  - Grundlegende Änderung an der Bediensystematik
  - Intuitivere, konsistentere Bedienung
  - Weniger Klicks nötig in typischen Anwendungsfällen

Multi Stage Assembly
Result List **Live Mode** LPACK
Parameter Compare
Multi RunConfig

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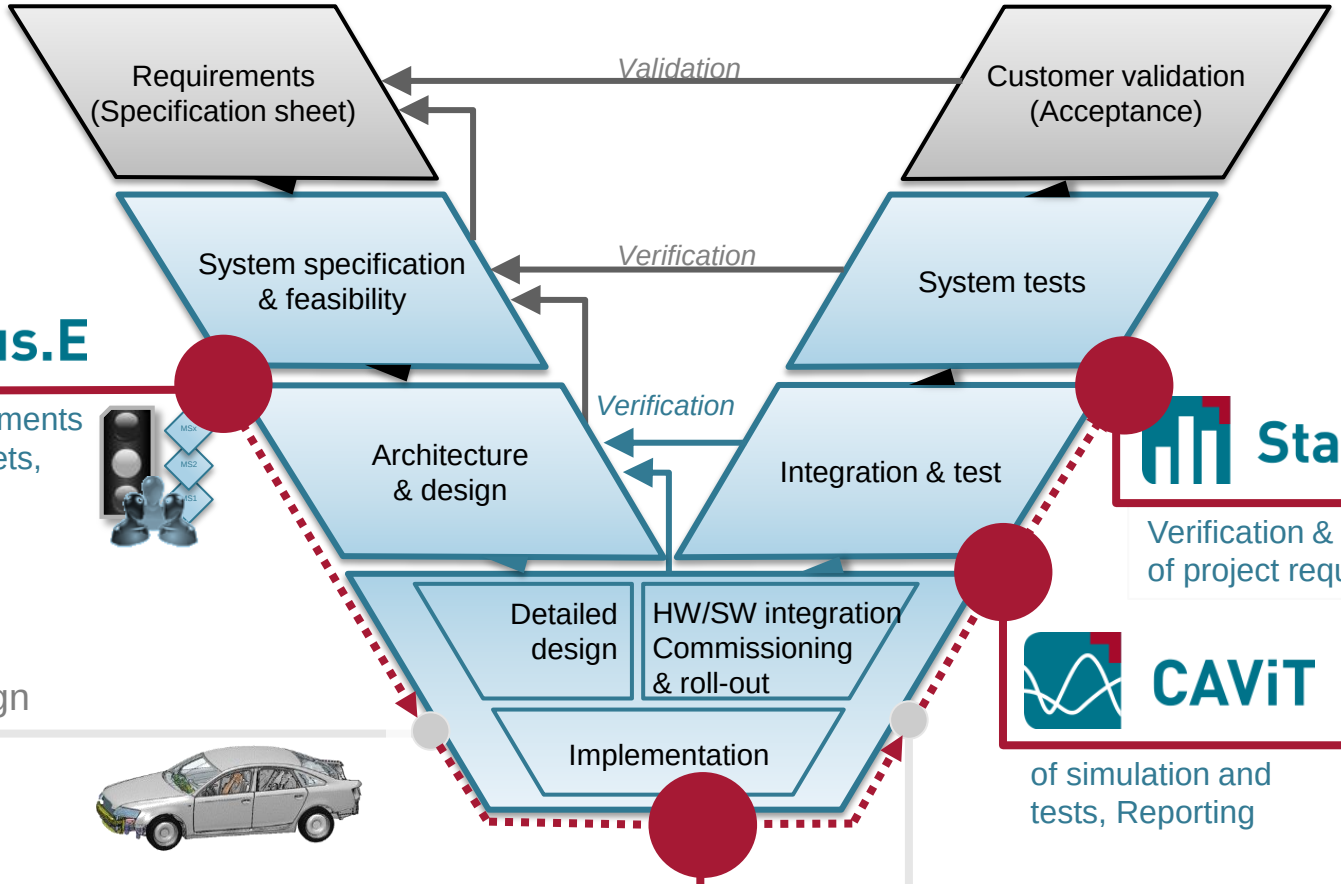
Systems Engineering Process



Status.E

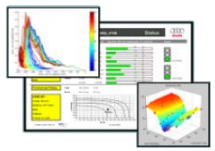
Setup of requirements and project targets, milestones and responsibilities

Status.E

Verification & monitoring of project requirements

CAViT

of simulation and tests, Reporting

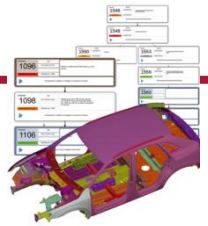


Detailed design

CAD / DMU

LoCo

Setup of simulation models



Solving / Testing

Perform simulation & test

SCALE

SCALE Products Today

multiple servers
with domain specific data models

SCALE LoCo Server

3rd party PostData Sources

SCALE Status.E Server

Synchronization

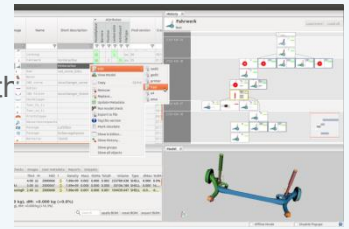
Synchronization

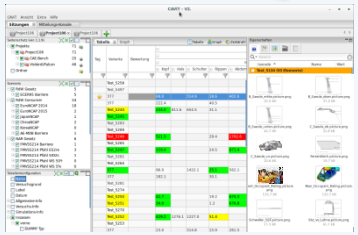
Synchronization

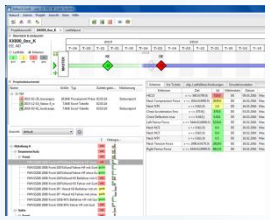
Desktop Apps

CAViT, LoCo, … realized on th
base client / framework

Local cache (performance)







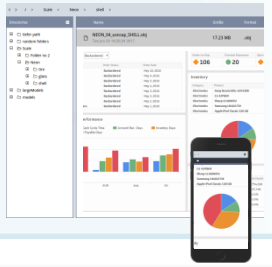
LoCo

CAViT

Status.E

Web Apps

Functionalities
also delivered as web app



Tomorrow: SCALE CAx-Hub

Hub

CAE_PRE

CAX_POST

Requirement Engineering

PostData Sources (3rd party)

One single server with domain specific data models

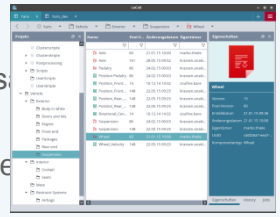
Synchronization

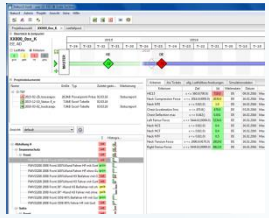
Synchronization

Desktop Apps

CAViT, LoCo, … realized on the s
base client / framework

They can be combined and shippe
one single application





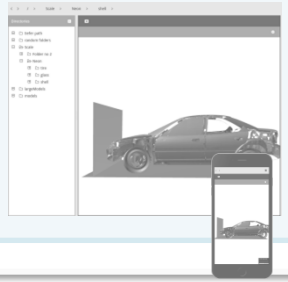
CADme LoCo

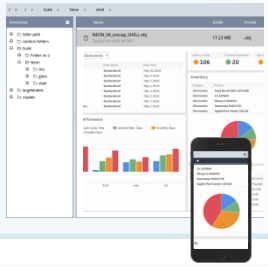
CAViT

Status.E

Web Apps

Functionalities will be
also delivered as web apps
(also on mobile devices)





SCALE

SDM
Simulation Models

Eval / Assessment
Reporting

Requirement Setup
Project Monitoring

Tomorrow: SCALE CAx-Hub

Hub

CAE_PRE

CAX_POST

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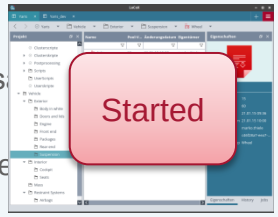

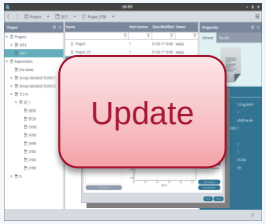

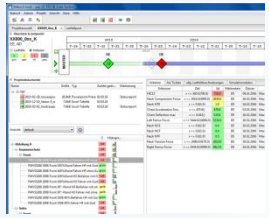

CADme LoCo

CAViT

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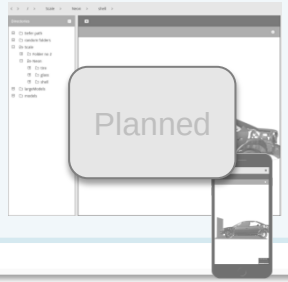
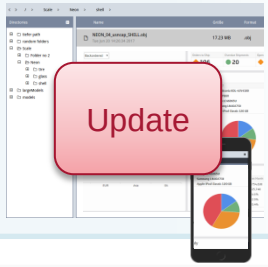




SCALE

SDM
Simulation Models

Eval / Assessment
Reporting

Requirement Setup
Project Monitoring

SCALE CAx-Hub

PDM-System

central data backbone and storage

Backbone PDM-System

Cax-Hub ist...
kein PDM

CAx-Hub

teamwork and collaboration

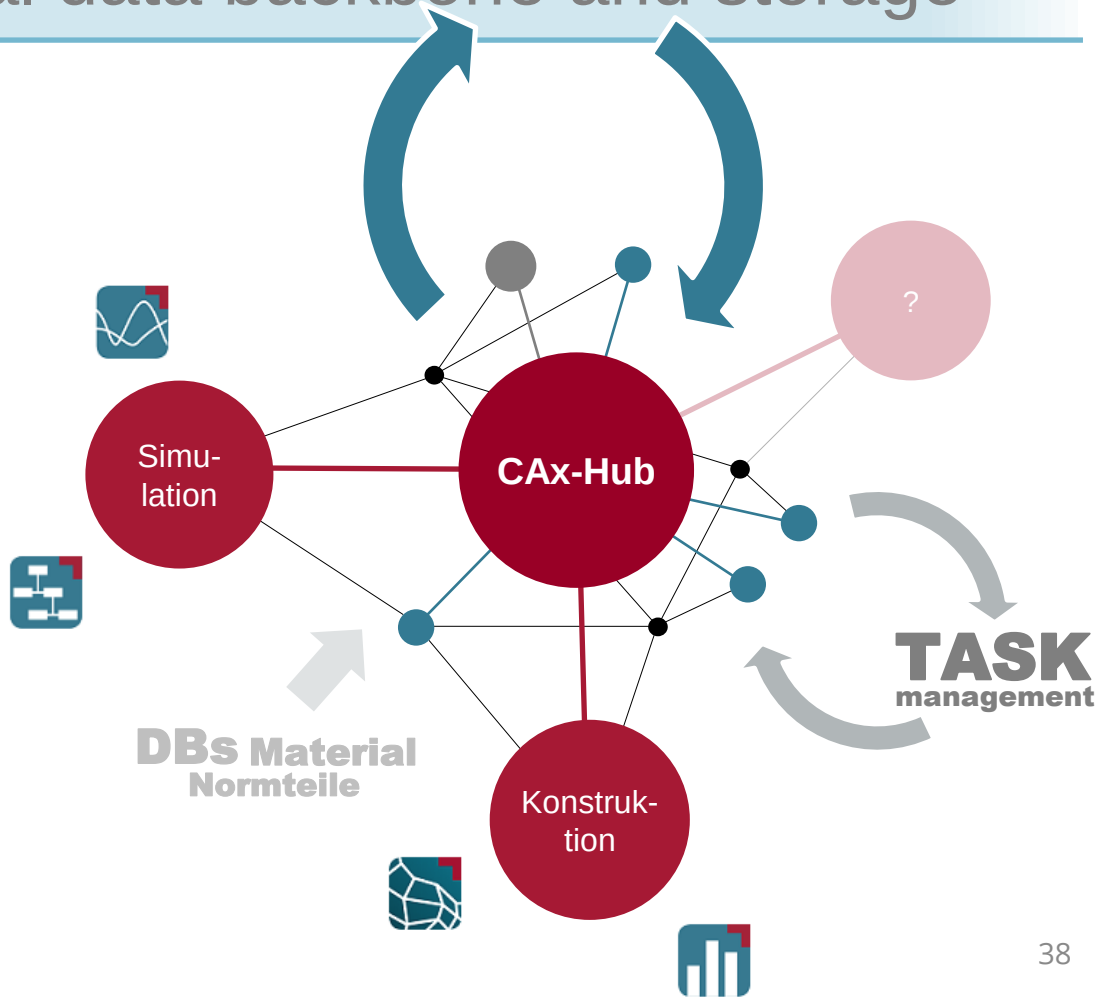
gemeinsam konstruieren

Schnittstelle für Tools und Apps

Echtzeitverfügbarkeit

Kein Dateisystem

Maschine Learning Apps



SCALE

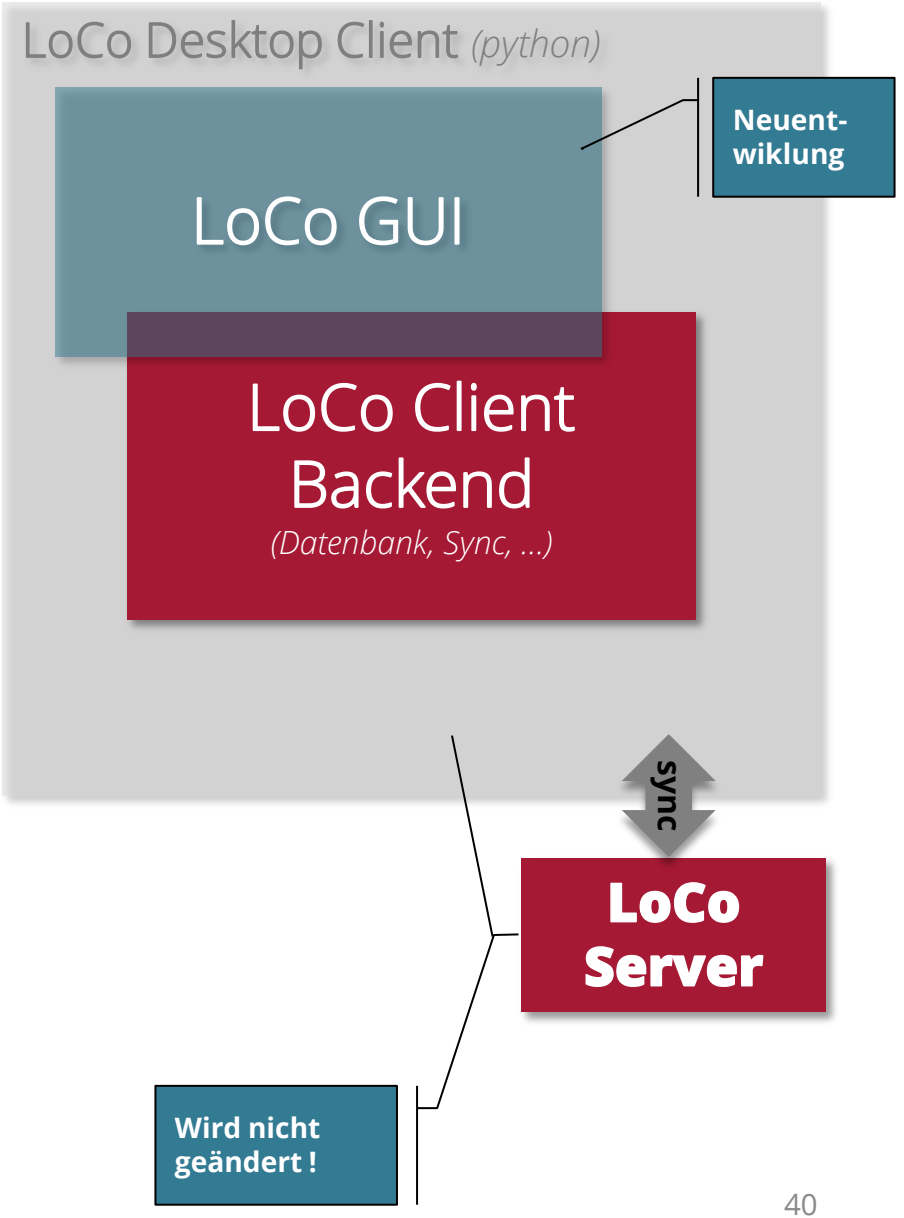
Agenda

- Einführung LoCo
  - Einordnung in den Gesamtprozess
  - Features
  - Gemeinsames arbeiten über Standorte hinweg
  - Integration CAD, CAE, …
  - LiveDemo
- Weiterentwicklung SCALE Produkte
  - Entwicklung in Richtung eines integrierten Systems (CAx-Hub)
  - RichClient vs. WebApp
- Ausblick und aktueller Stand LoCoX - Entwicklung
  - GUI Konzepte
  - LoCoX Workshop
  - Live Demo

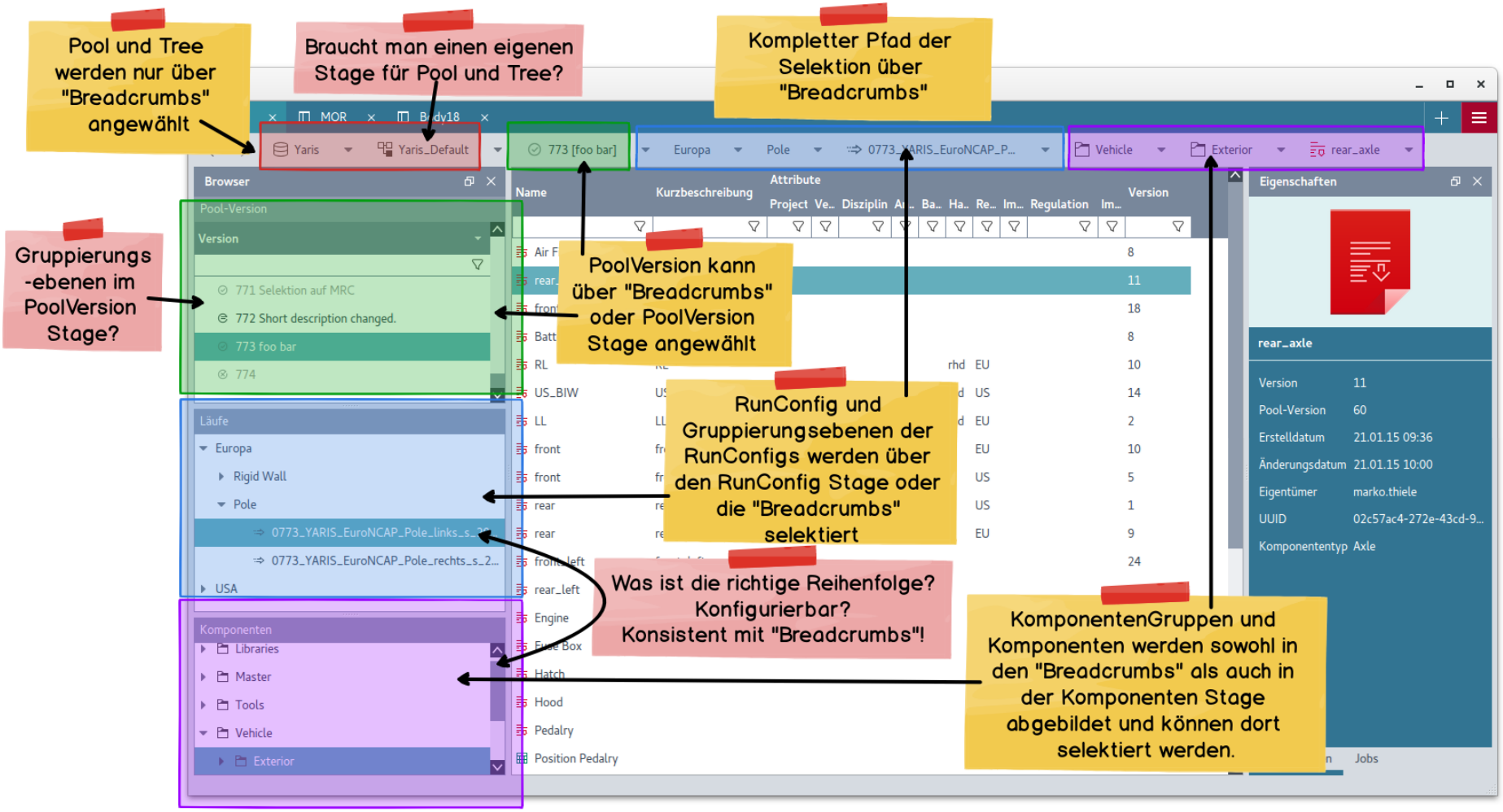
Current Development: LoCoX

- **Gründe zur Neuentwicklung**
  - Veraltete Softwarekomponenten
    (Python 2.7 nur noch bis 2020, wxWidgets, …)
  - Optimierung der Bedienparadigmen
    (mehr Konsistenz, weniger Redundanz, …)
  - Integration aller SCALE Produkte
    (Einheitliches Datenmodell, WebApps, …)

- **Kompatibilität zu LoCo2**
  - Interne stärkere Kapselung zwischen GUI und Backend *(Kapselung in separate Klassen)*
  - Neuentwicklung von LoCoX GUI
  - Basis von LoCo2 und LoCoX GUI bleibt identisch
    (Anwender kann GUI bel. wechseln)

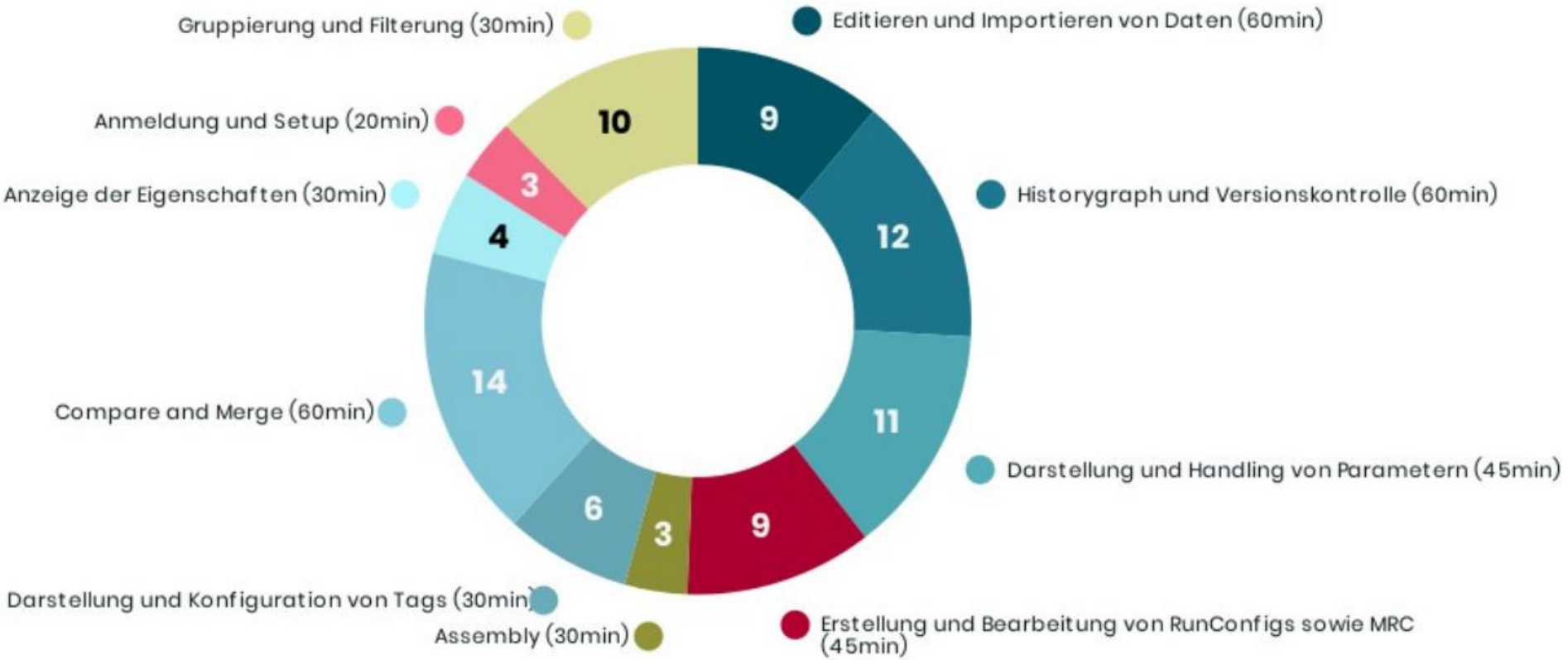


Entwicklung LoCoX - Konzept



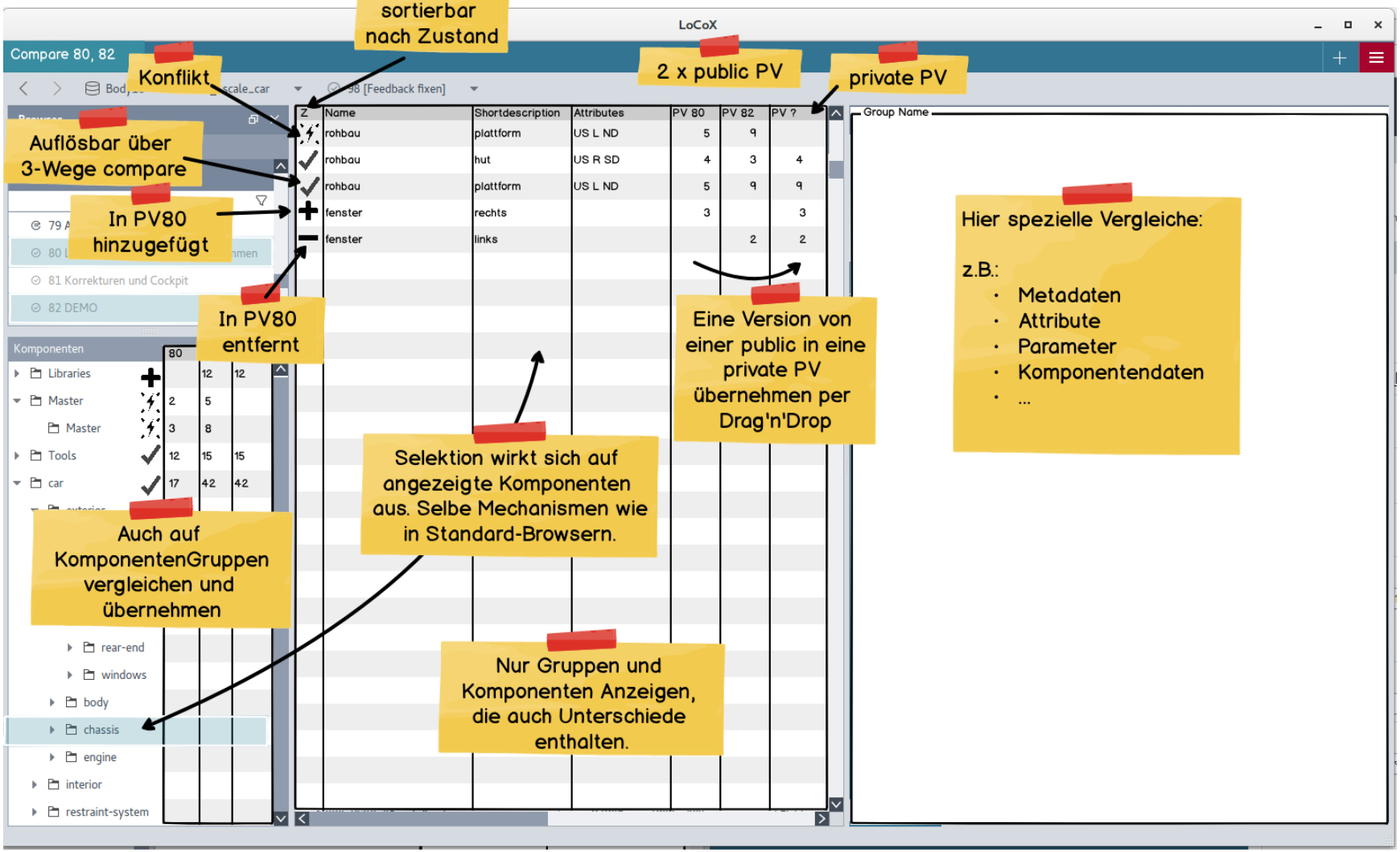
SCALE

Entwicklung LoCoX - Workshop



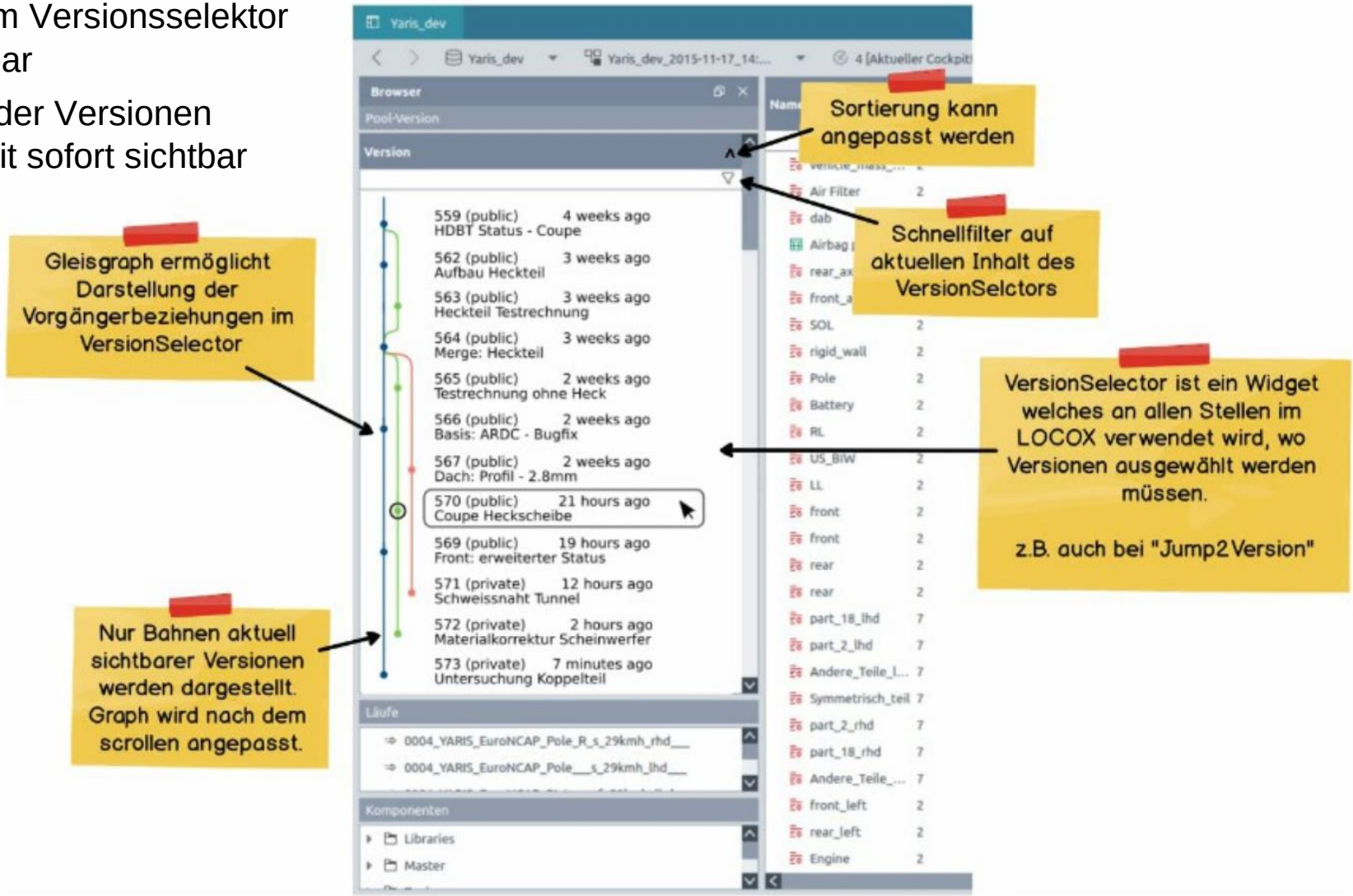
Compare & Merge

- Nahtlose Integration mit Standard Bedienelementen



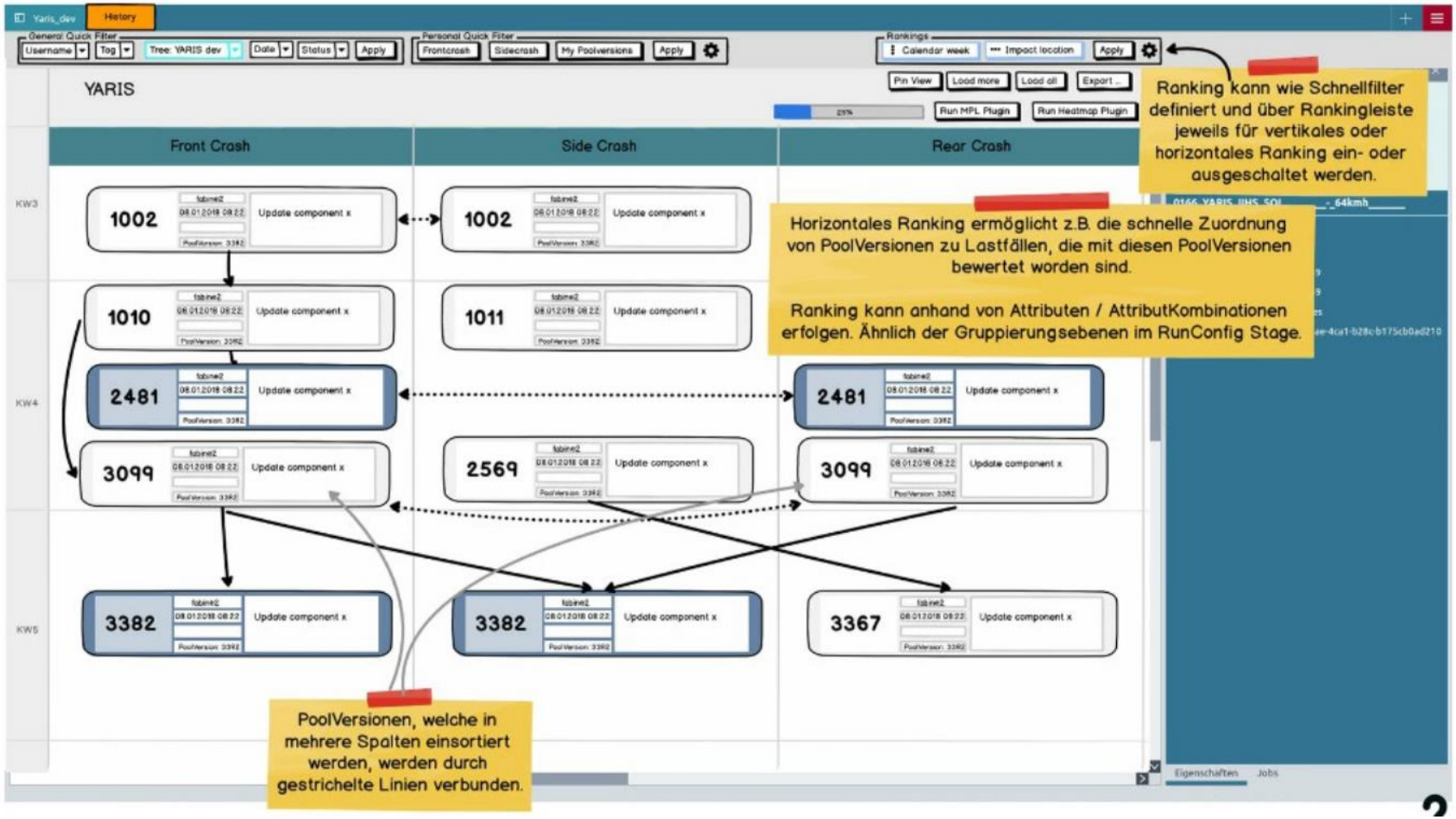
Gleisgraph als Ergänzung zum Historygraphen

- In jedem Versionsselektor verfügbar
- Bezug der Versionen jederzeit sofort sichtbar



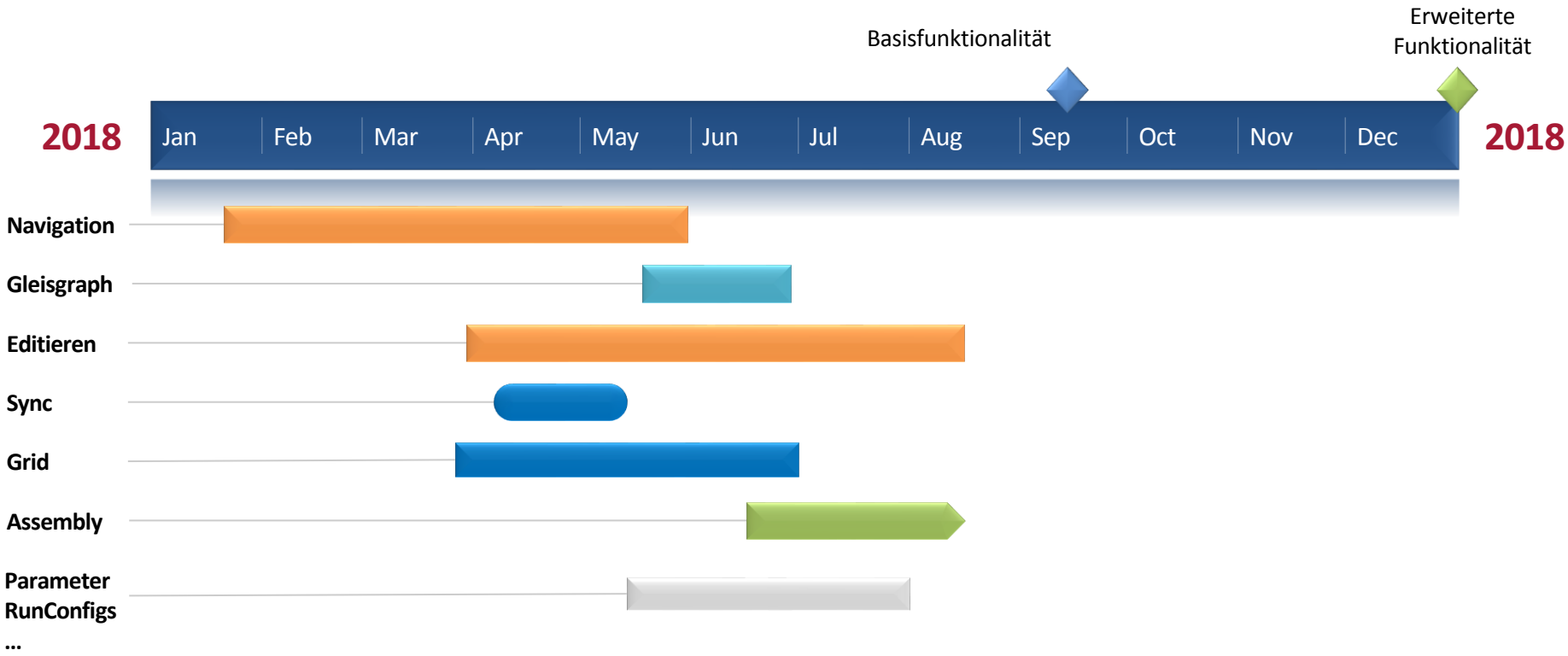
Fokus regulärer Historygraph

- Mehr Filtermöglichkeiten
- Einstellbare Gruppierungen / Rankings
- Schnellfilter, Suche
- Plugins für spezielle Anfroderungen

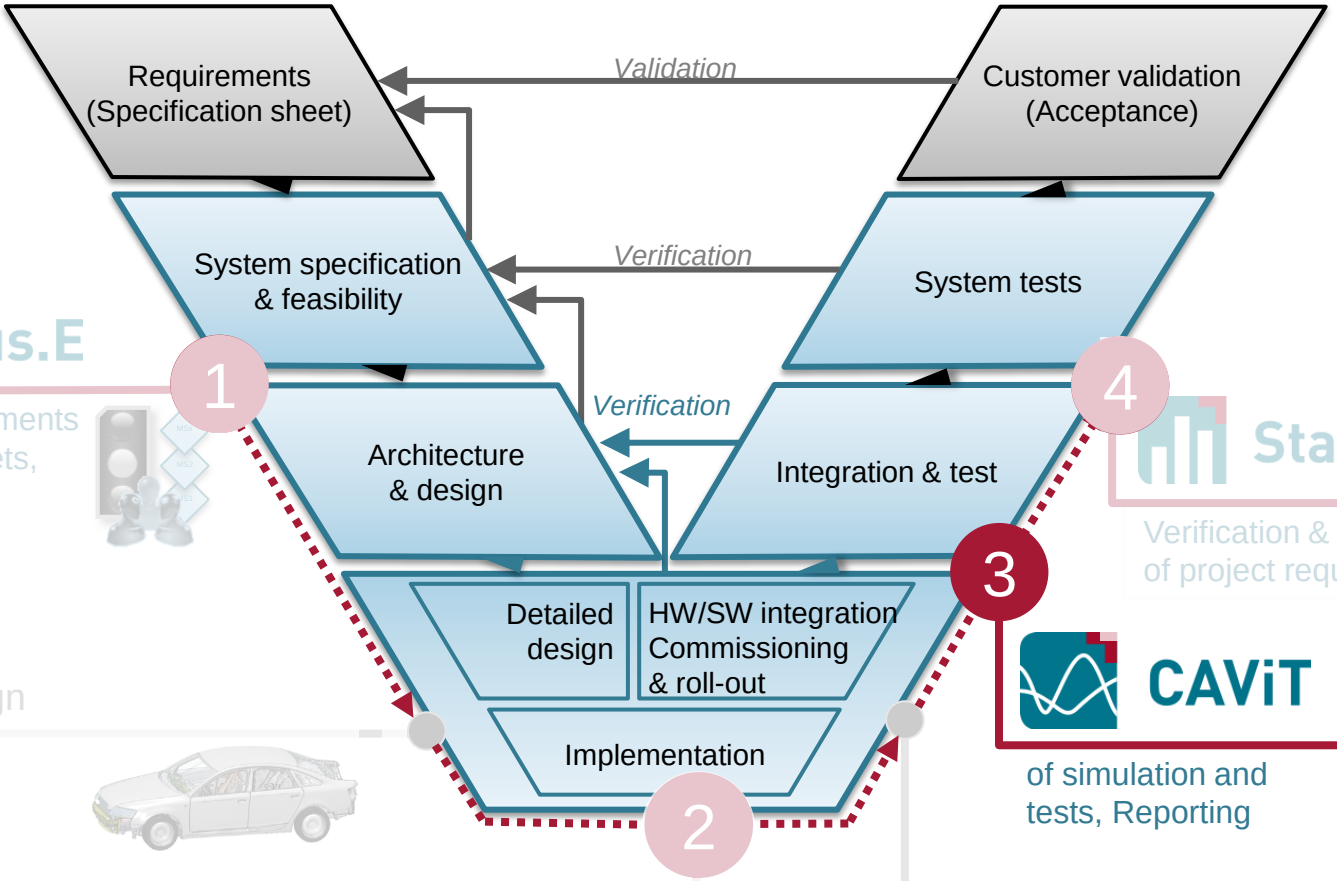


Entwicklung LoCoX - Zeitplan

- Entwicklung von LoCoX parallel zu LoCo2
- Keine Neuimplementierung mehr von GUI Features in LoCo2
- LoCoX Versionen werden parallel zu LoCo2 Versionen released
- LoCoX Versionen sind im Backend vollständig kompatibel mit LoCo2
- Wechsel zwischen LoCoX und LoCo2 problemlos möglich



Systems Engineering Process



Status.E

Setup of requirements and project targets, milestones and responsibilities

Detailed design

CAD / DMU

LoCo

Setup of simulation models and test prototypes

Status.E

Verification & monitoring of project requirements

CAViT

of simulation and tests, Reporting

Solving / Testing

Perform simulation & test

so long, and thanks for all the fish...