LoCo

An Innovative Process and Team Data Management

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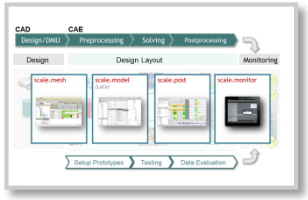
May 2016

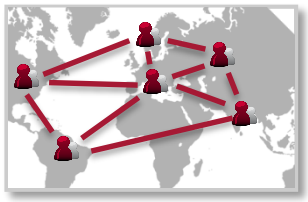
SCALE

Agenda



Introduction LoCo and SCALE.sdm

- Software Components
- Key Features
- Unique selling points



Decentralization of Development

- Integration of suppliers and engineering providers
- Connecting multiple locations
- System architecture, operations

Recently added

- Check Infrastructure
- Multi run setups
- Advanced Search
- Copy'n'Paste
- Offline Sync
- Multi stage Setups

In development

- New Compression techniques
  - **Input Data:** Data Deduplication
  - **Output Data:** Support for SDM-Zip
- Live Mode
- CAD/Meshing Integration
- Integration with colaboration systems
- UI redesign of SDM clients

SCALE

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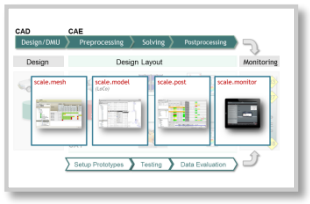

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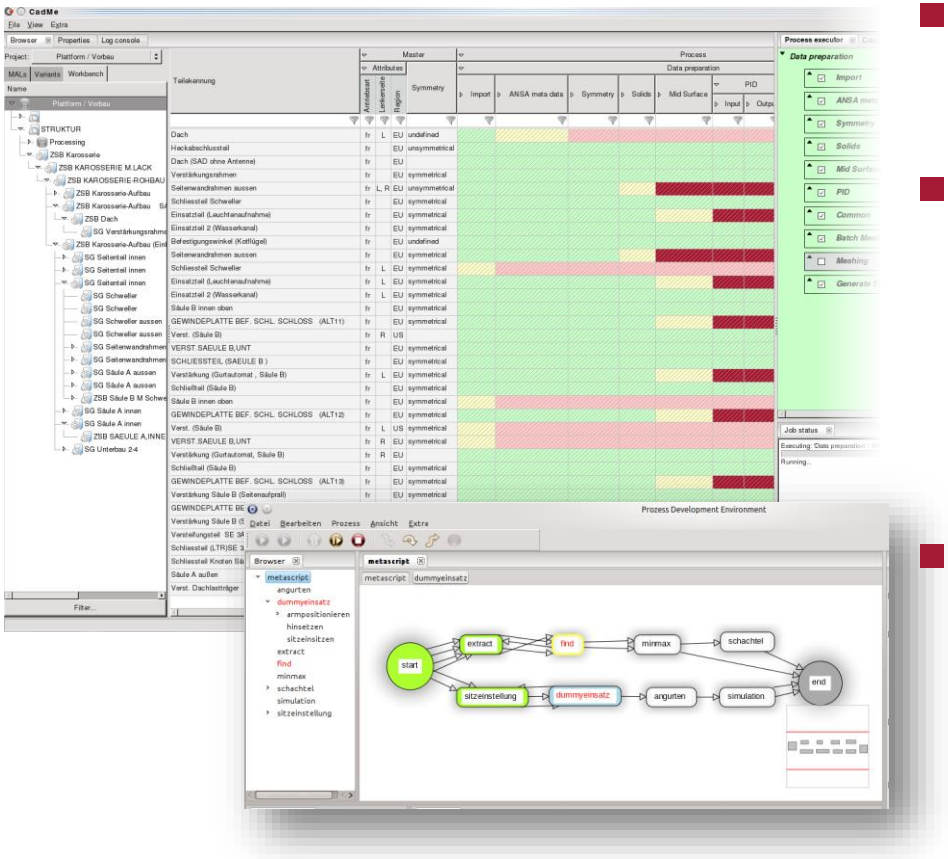
SCALE.sdm: *Components*

CadMe

CadMe | LoCo | CAViT | Status.E

CAD/Meshing → Modelling → Solving → Results → Monitoring



CAD Interface

- Update and check of new CAD-versions with meshed parts

Meshing Process

- Support of meshing process
- Provision of data
- Flexible adaptable process
- Integrated tools for process modeling
- Integration of preprocessors *(ANSA, Hypermesh, ...)*

Data Management

- Synchronization of work flow for all participants *(internal and external)*
- Changes appear instantly for all team members
- Role and right management

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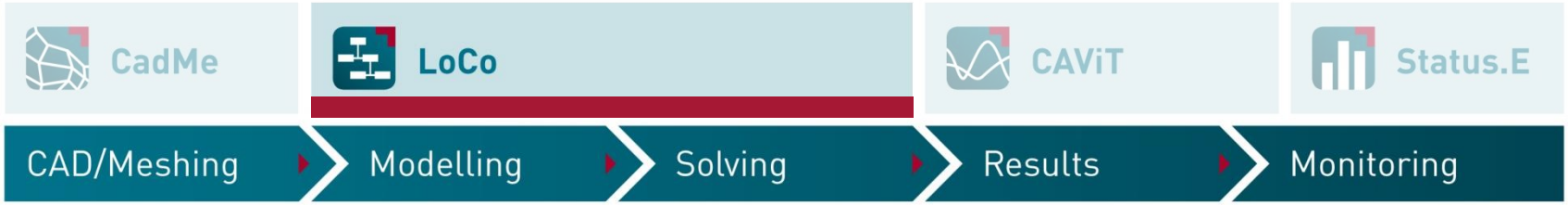
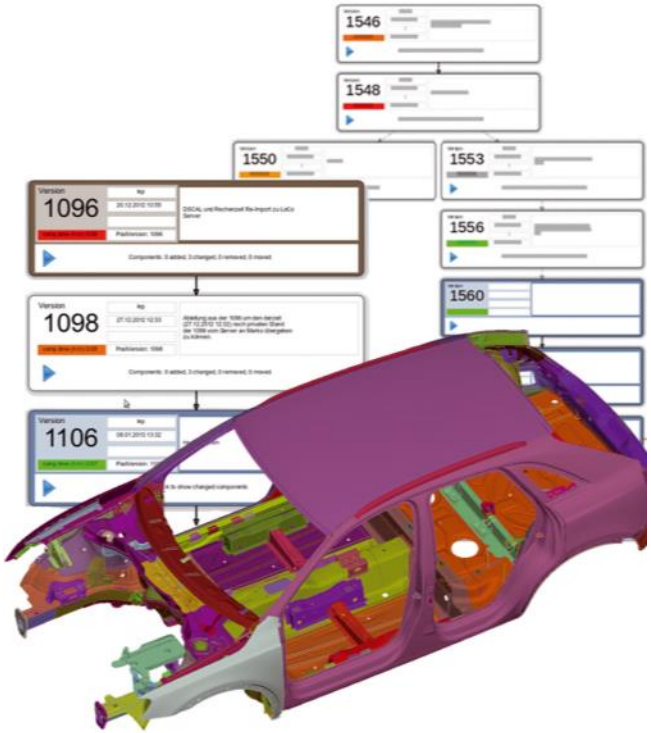
SCALE.sdm: *Components*

LoCo





- **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
    - Sofisticated roles and rights management
  - Distributed, collaborative work environment
  - ....

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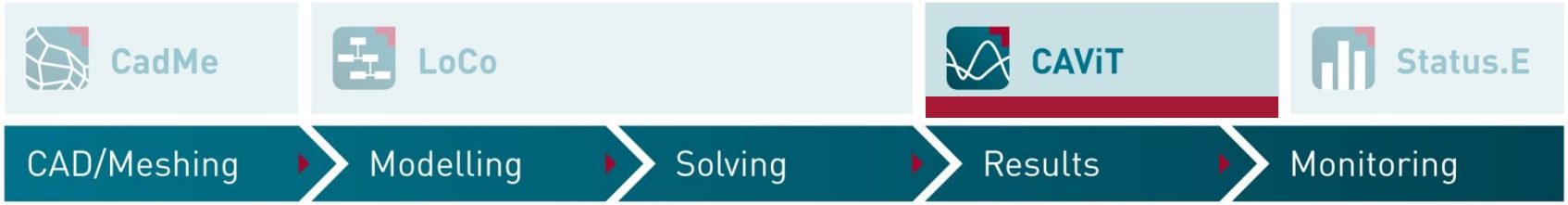
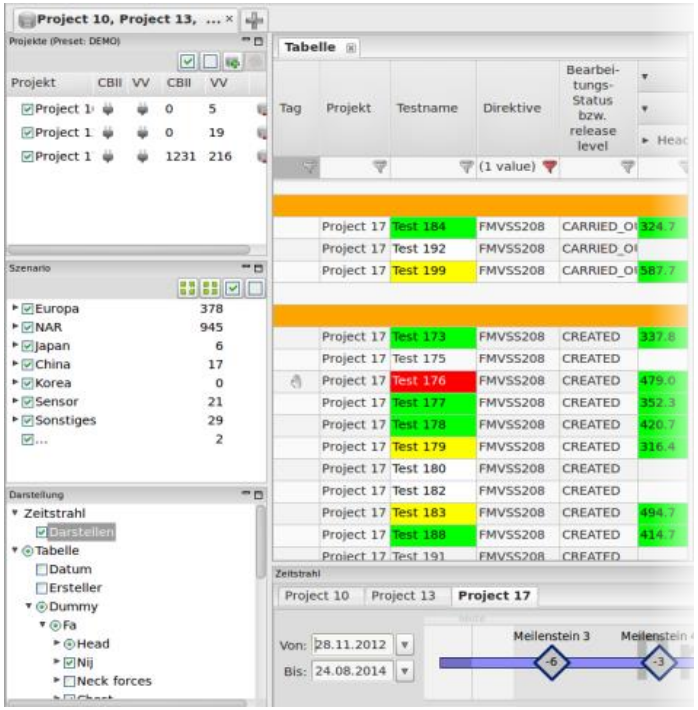
SCALE.sdm: *Components*

CAViT





Post Data Management

- Procurement and provision of outcome data from **simulation** and **experiment**
- Comparison and visualization of simulation and experimental data

Features

- Assessment of simulation and experimental results *(szenario based)*
- Easy integration of any application and processes *(Plugins for e.g. Animator, Falcon,..)*
- Automatic report generation
- ...

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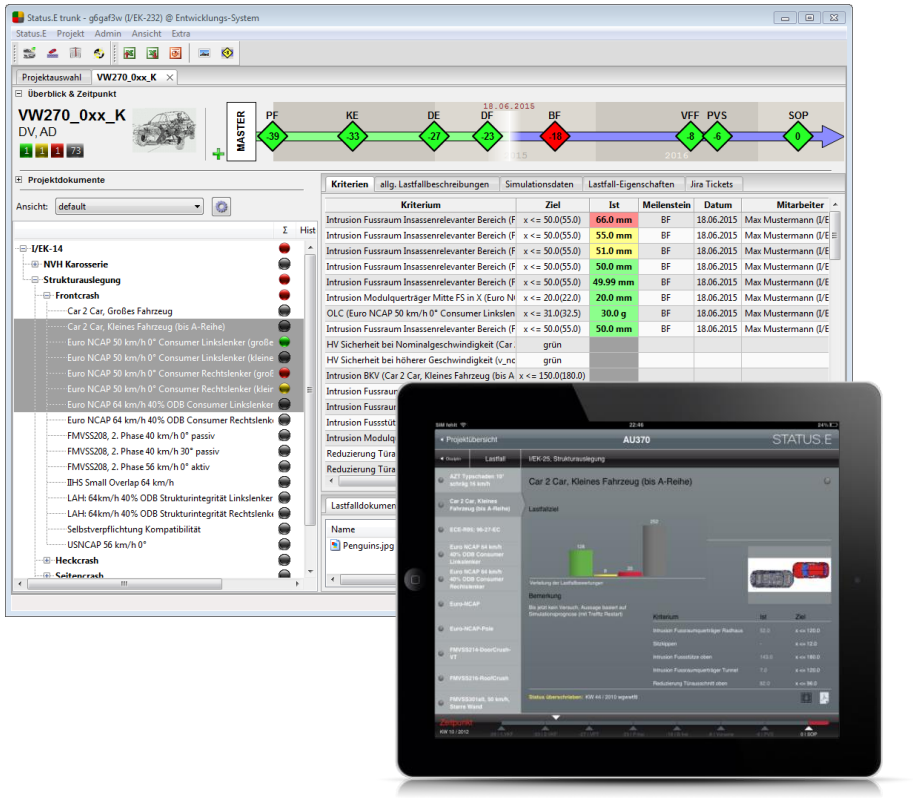
SCALE.sdm: *Components*

Status.E

CadMe | LoCo | CAViT | Status.E

CAD/Meshing → Modelling → Solving → Results → Monitoring



- **Requirements management**
  - Management of project and milestone specific Requirements
  - Automatic generation of specifications
  - Change management
- **Status Monitoring**
  - Monitoring of the performance of simulation and test requirements with respect to project milestones
  - Aggregated review over CAE-disciplines and simulation departments
- **Documentation**
  - Integrated document management system
  - Automatic generation of status reports *(ppt, doc, pdf)*

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SCALE.sdm: *Software Solution for Management of Simulation Data*

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Focused

- One dedicated App for each user group
- Reduced to meet the requirements of the use cases in question

Flexible

- Software components can be combined as required
- Easy integration of new disciplines and processes

Integrated

- All software components work seamless together
- Performant integration of pre and post processors

Decentralized

- Unique synchronizing technologies for distributed teams

Scalable

- Business logic close to the users
- Advanced compression techniques to reduce bandwidth and storage requirements

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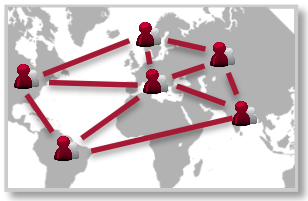

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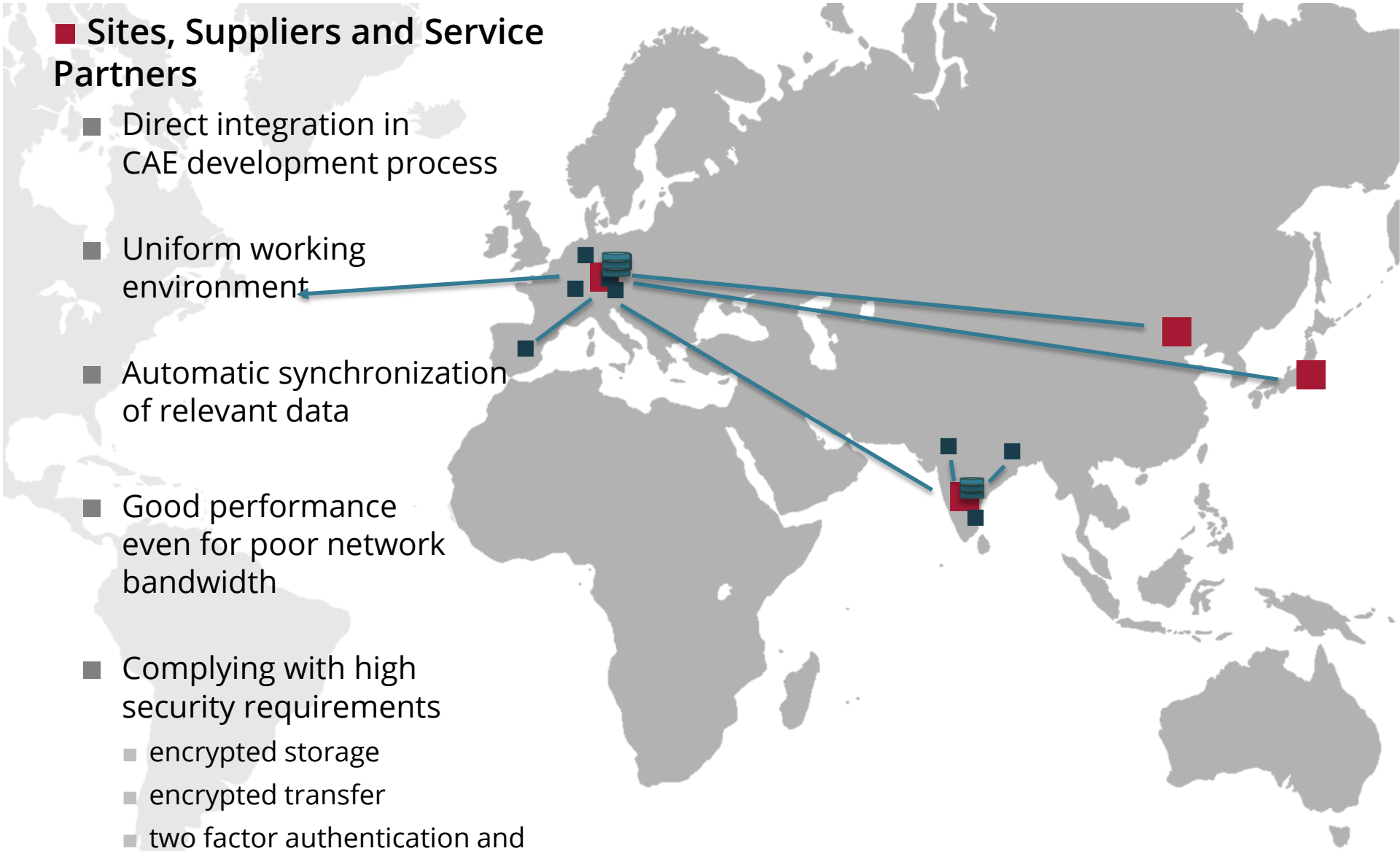
SCALE.sdm: *scaling development by decentralization*

Sites, Suppliers and Service Partners

- Direct integration in CAE development process
- 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



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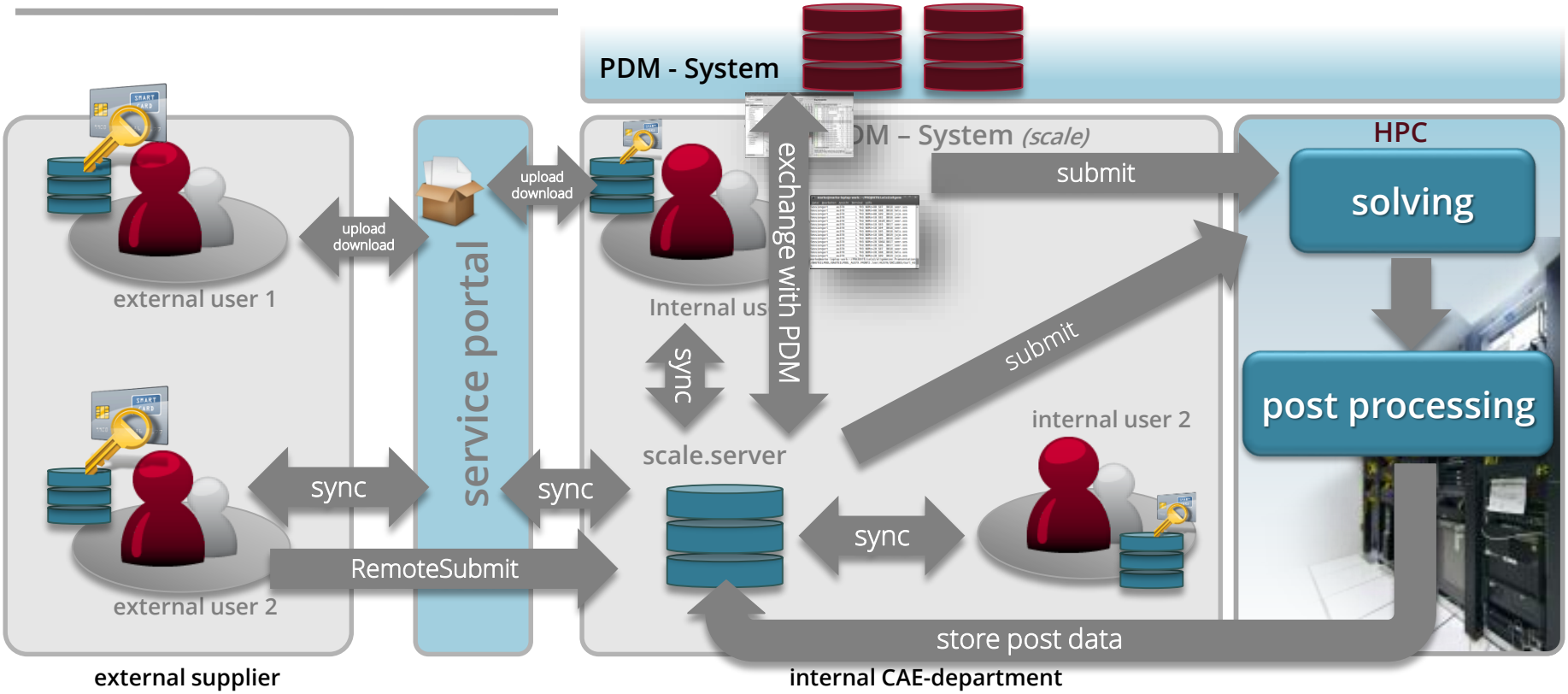
scale.SDM: *Workflow, Teamwork and Synchronization*



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)*

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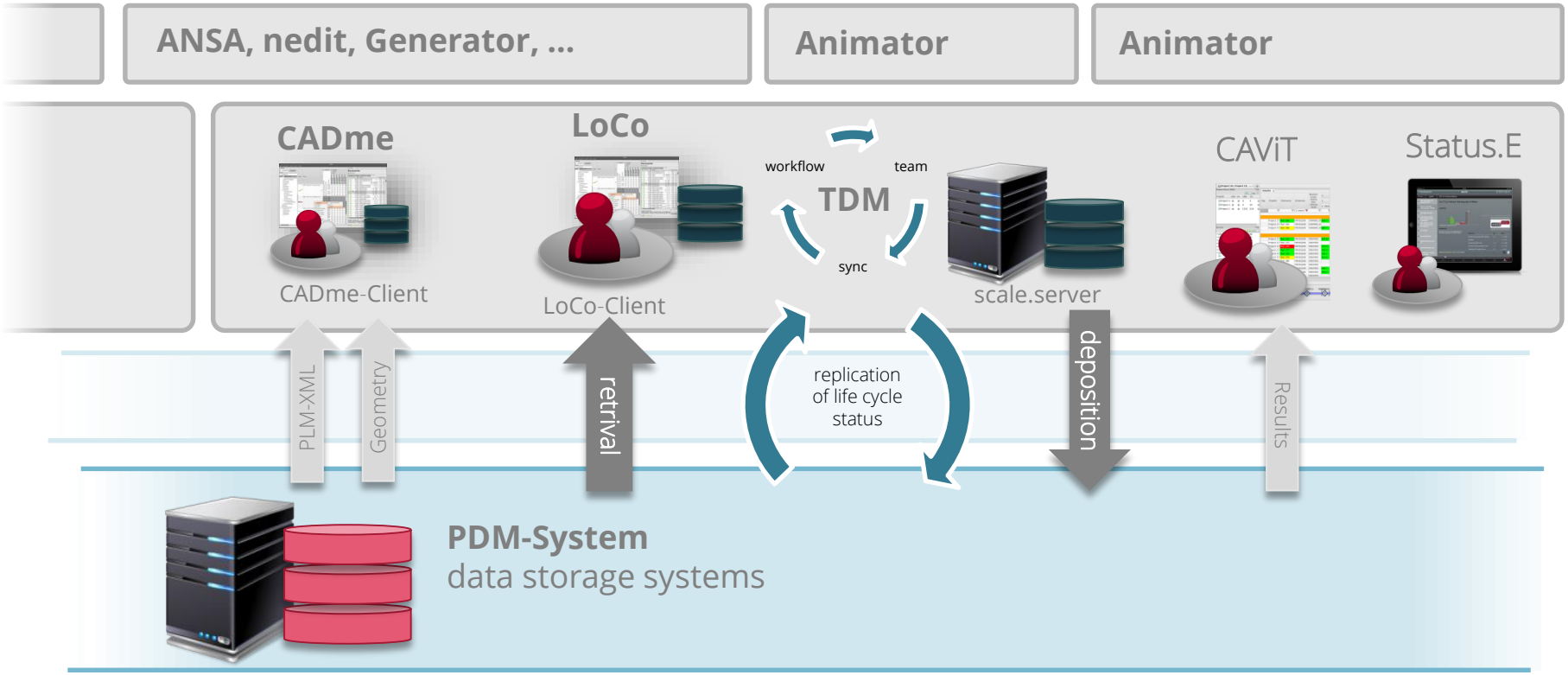
SCALE.sdm: *Integration with PDM Systems (Team Data Management)*



- **Automatic / 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 between TDM and PDM/Storage Systems
- **Automatic cleanup: storage space in scale.server might be restricted** *(by time and or size)*
- **Replication of life cycle status** *(reference, status, ...)*

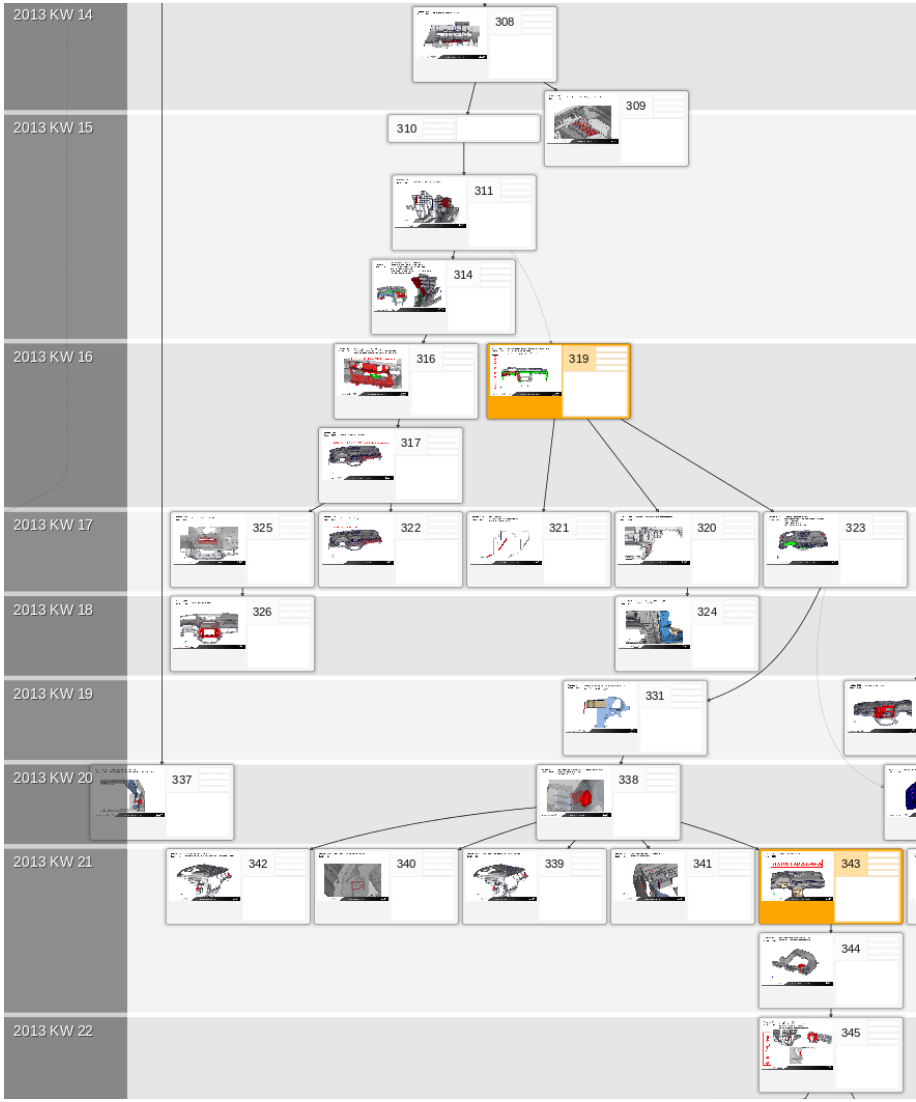
SCALE.sdm: *Versioning / Documentation*

- **Every object is versioned**

Simulation Runs
Scripts **Includes** Folders
Meshes Parameters

- **Motivation**
  - Simultaneous work on the same files
  - Each action is documented
  - Powerful features to merge changes

- **Audit trail and Versioning**
  - Audit trail represented by data structure
  - Versioning extends audit trail over time
  - The audit trail becomes multi dimensional



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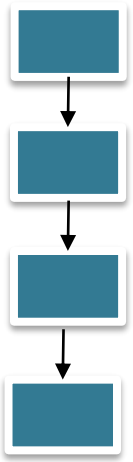
SCALE.sdm: *Versioning / Documentation*

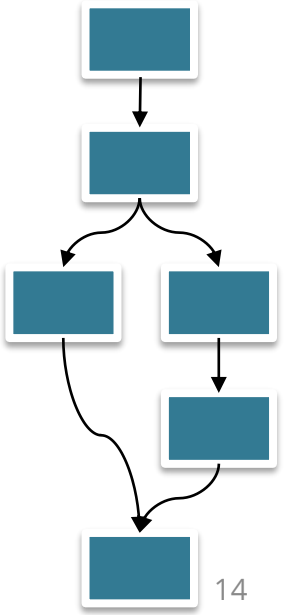
- **„Lock Modify Write“** *(classical PDM Systems)*
  - Objects are locked if one person is working with them
  - After the work is done users need to check in the changed items
  - Problematic in situations where team members need to work independently
  - No simultaneous working with the same objects
  - Instant access to changes of coworkers
  - Always consistent data *(no merging of data required)*

CADme



- **„Copy Modify Merge“** *(LoCo, git, svn, …)*
  - Objects can be used instantly *(on changes a copy will be created)*
  - No „check in“ – „check out“ necessary
  - Users can act independently from other users and servers
  - Simultaneous work on the same objects is possible
  - It’s possibly required to merge branches

LoCo



SCALE.sdm: *Variant management*

component pool

component parameters

airbag TTF	1.0mm
vent area	
sheet thickness	...
calc time	
friction	1.4mm

Assembly of multiple load cases and derivates

Coupé

Convertible

Setup of optimizations and DOEs

- Parameters and optimization goals are defined
- Assembly of vast amounts of simulations

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SCALE.sdm: *Variant management*

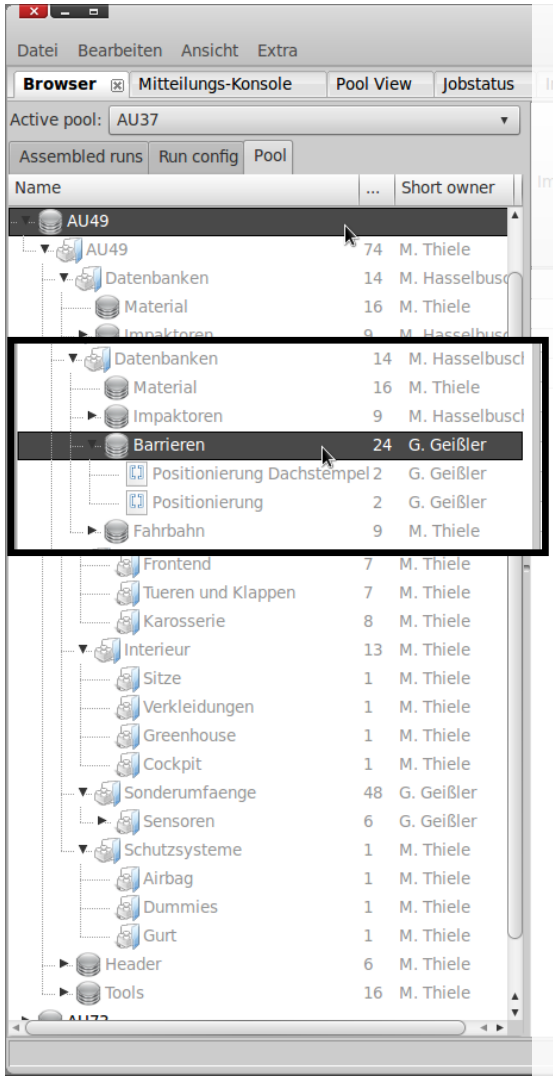
Pool

Region	Zone	Side	Dummy
Europe			

Attribute based assignment

- Definitions assigned to components
  - Region: EU, US
    - Components are used only for US or EU
  - without attribute:
    - Components are used always
- Same approach for parameters
- Changes get automatically applied to all relevant simulations
- Easy creation of new setups
- Users need to get used to it

SCALE.sdm: *Project setup*



- **Homogeneity:** Common components wherever possible
- **Access Management:** Not everybody can edit any component *(e.g. Materials)*
- **Libraries:** Direct access and integration
  - Materials
  - Barriers
  - Impactors
  - Engines
  - Dummies
  - ...

- Uniform model structure for all departments

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SCALE.sdm: *Job submit and monitoring*

Job Submit

Instant start of jobs on the HPC-cluster

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

Job Control

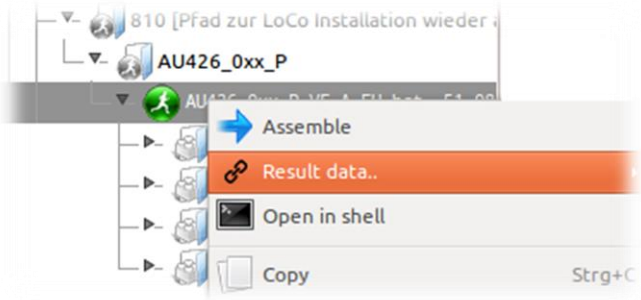
Monitoring job progress on the HPC-cluster

- 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 postprocessors



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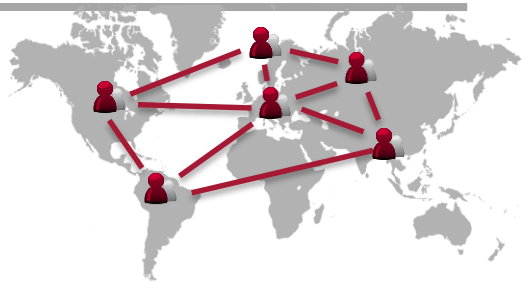
scale.SDM: *Example for operation*



- **~400 active users each month** *(~750 registered total...)*

- **server is self hosted by client**
  - slim server architecture, low server load, easy setup
  - service friendly operations
  - no high availability required due to software architecture
    (offline capable clients, decentralized synchronization)
  - allows for maintenance during regular working hours
  - complying with state of the art security standards

- **~850.000 simulations assembled during last 4 years**
  (~estimated 400.000 jobs submitted to HPC)
  - the entire history of how each simulation that has been created can be browsed down to the history of each include
  - any single simulation or include can be extracted at any time from the system

- **just ~4TB of total storage occupied on server for all simulation input data**
  - achieved by file level data deduplication
  - In the future compression levels can be increased by fact. 4 *(block level data deduplication)*

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scale.SDM: *LoCo Live*

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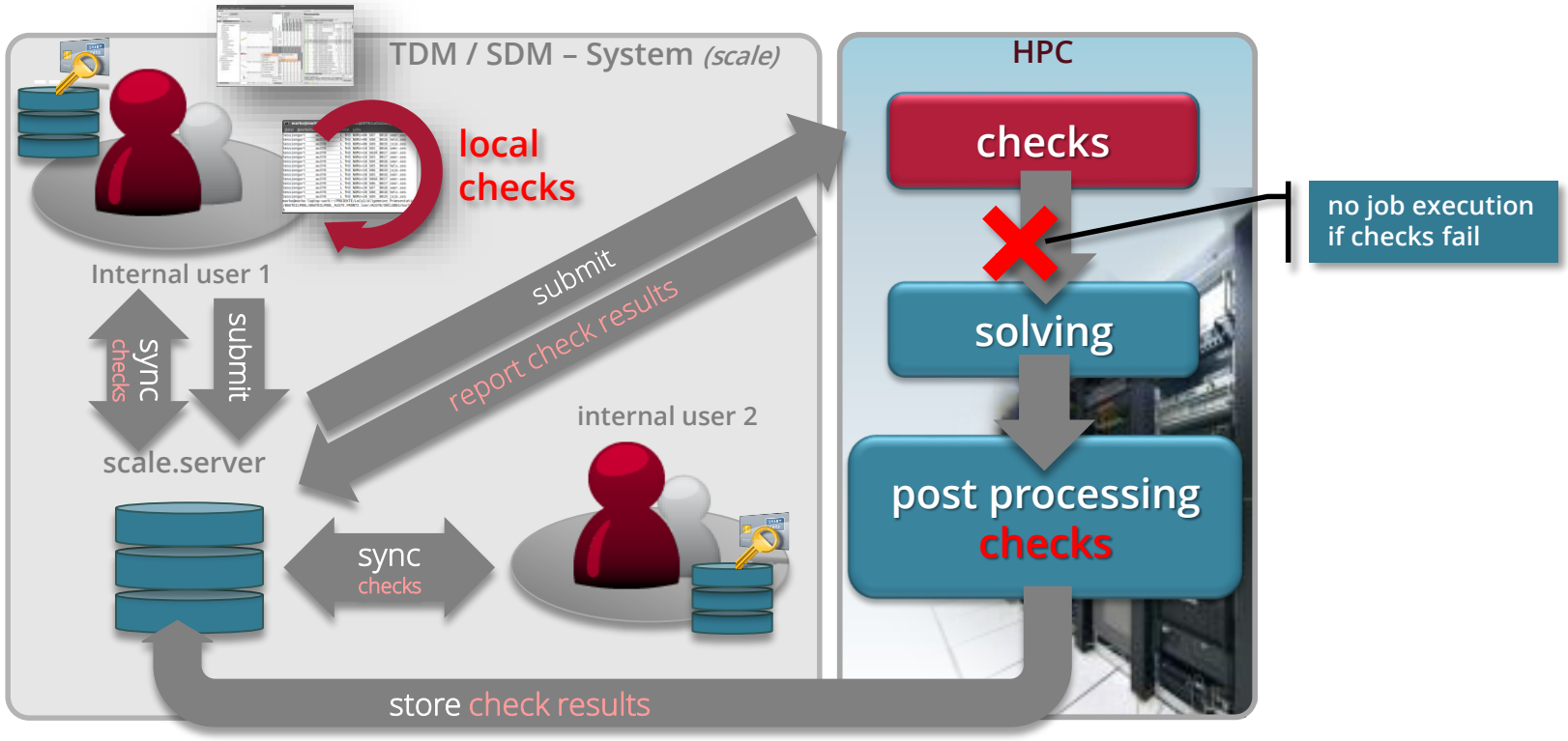
Recently added: *check infrastructure*



check early
immediate actions

check often
prevent errors
save ressources

- Checks are carried out as early as possible in the process
- Checks are integrated by using existing tools and scripts
- Checks are enforced at various occasions during the process
  - Each time a file changes
  - Bevor solving
  - As part of the post processing
- Checks can stop the process
- Check results are synchronized among all users

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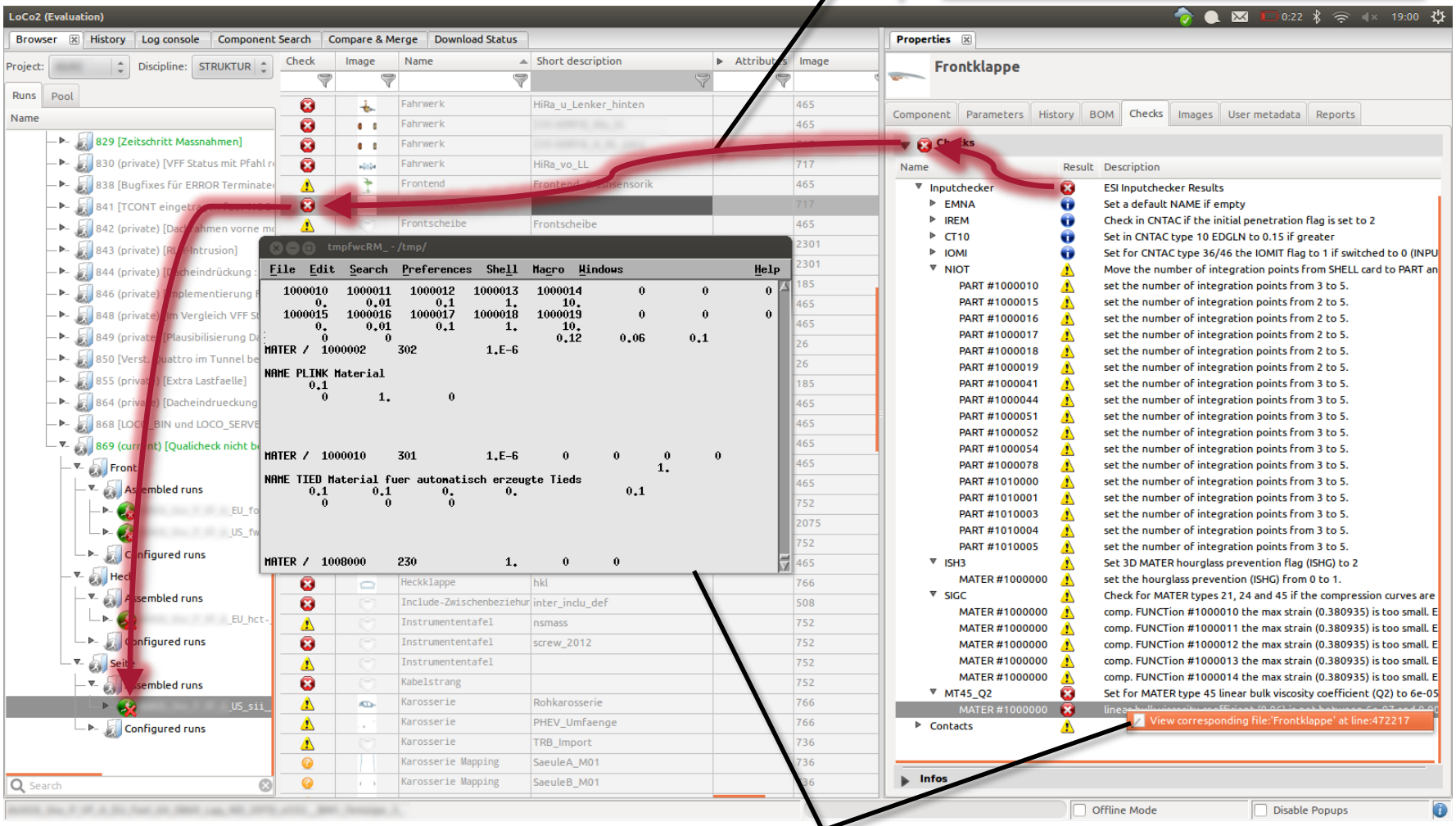
Recently added: *check infrastructure*



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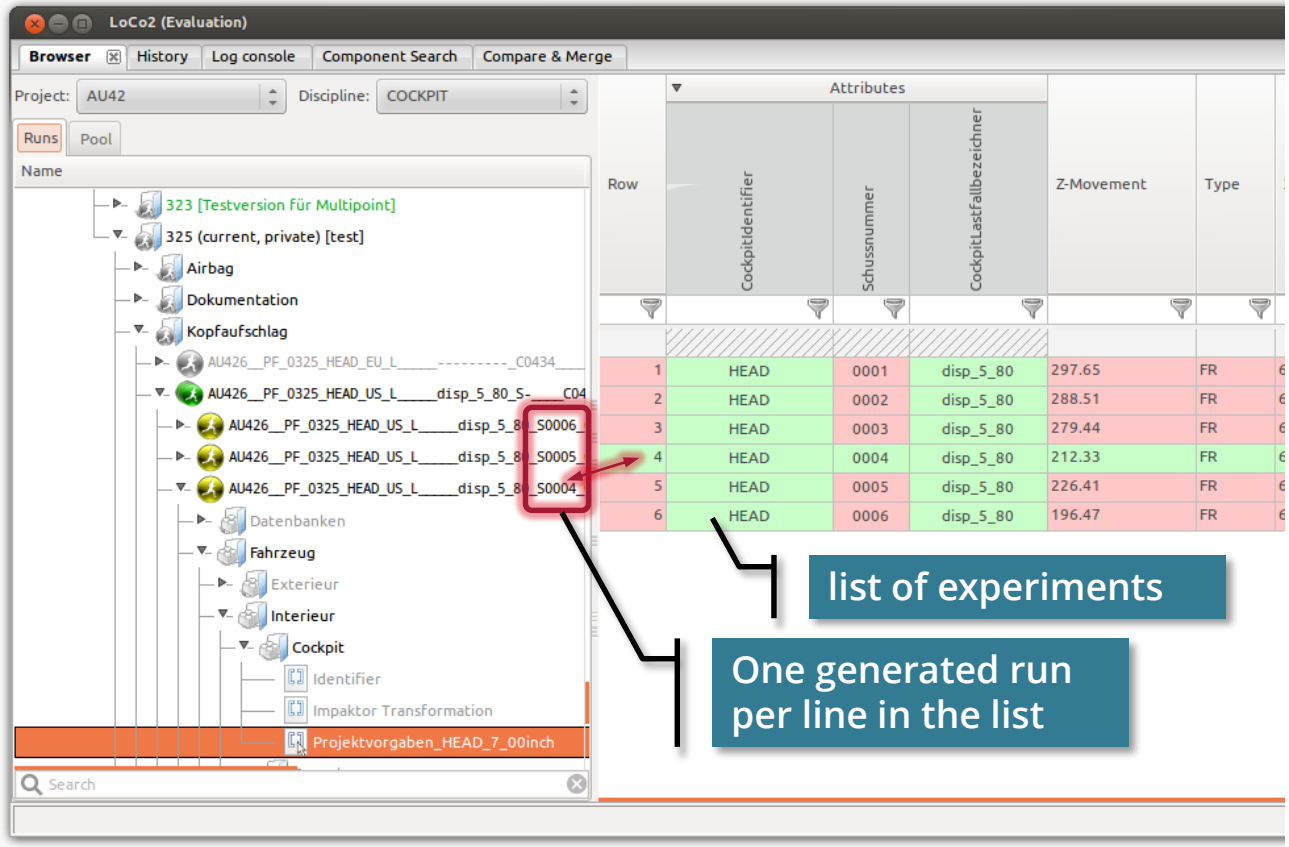
Recently added: *multi run setups*

- Automatic generation of multiple runs
- Permutation trough a provided list of experiments
- Integration with LS-OPT
- Usecases
  - Cockpit
  - pedestraint
  - Sensorik
  - …



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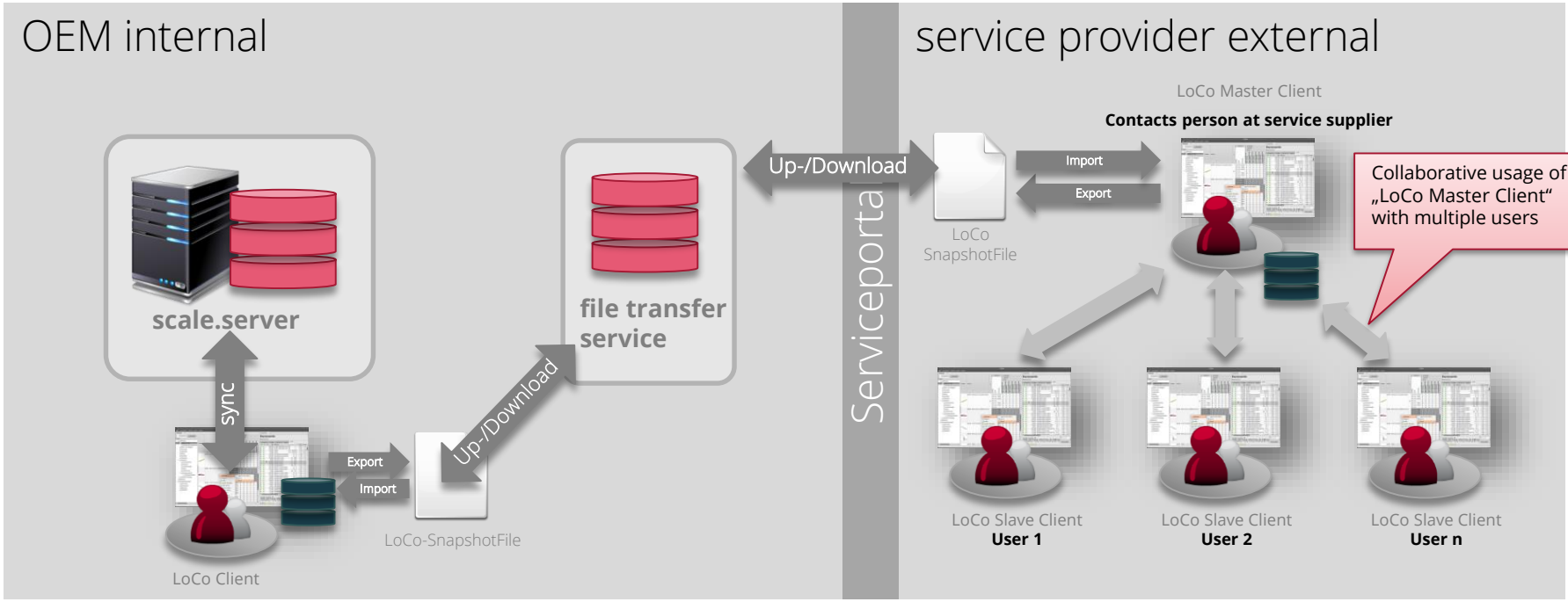
Recently added: *complete offline usage*



- Fast integration for new service suppliers
- Minimizing on site resources
  - Less traffic
  - Less user accounts
  - Less server load
- Use existing file transfer mechanisms
- Bridge technology to get started while planning a tight integration

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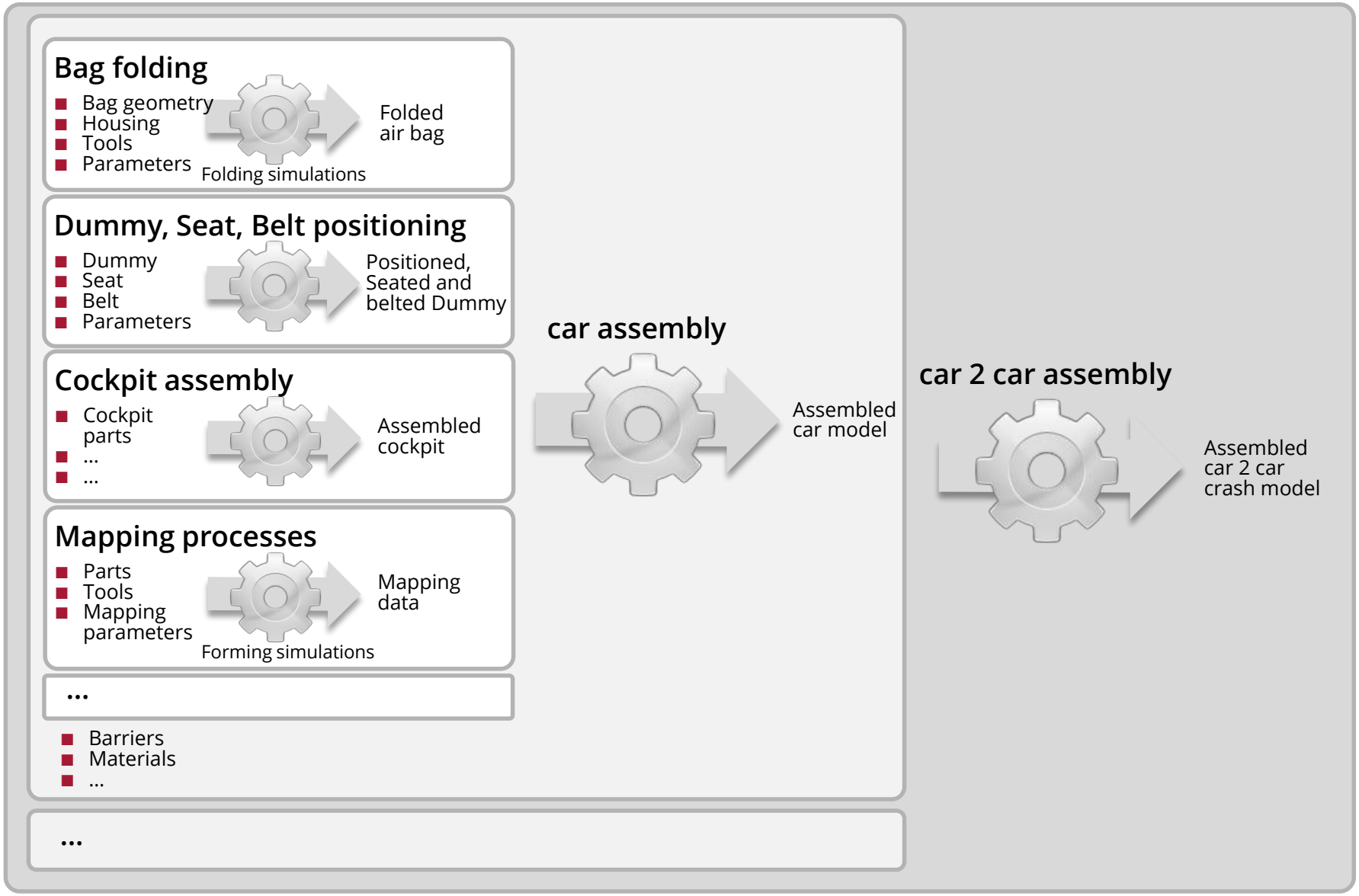
Recently added: *multi stage assemblies*



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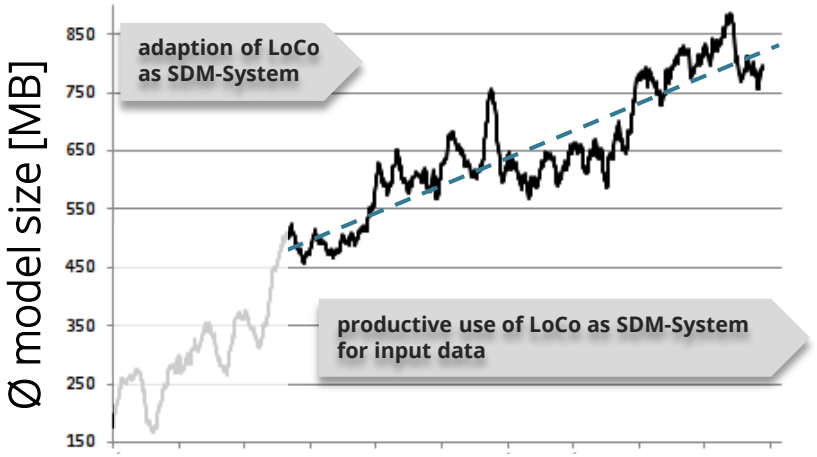
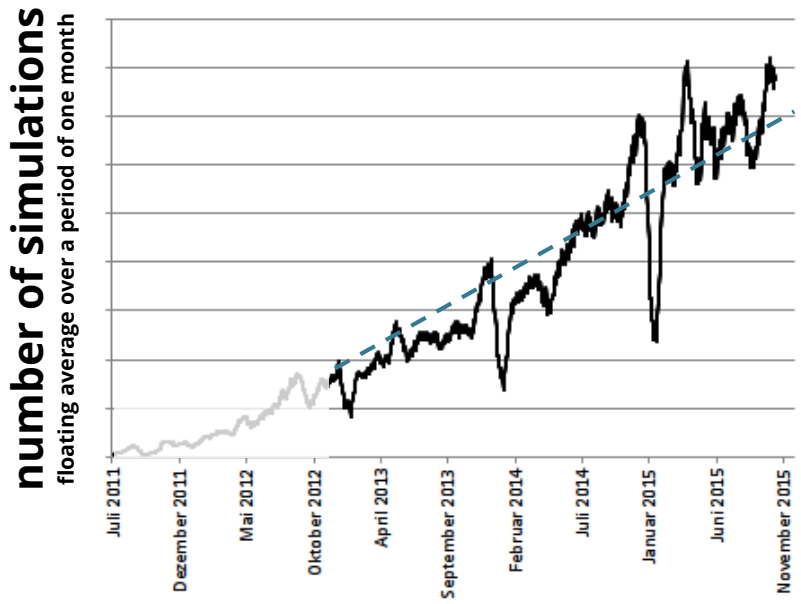
In development: *compression*

- **Increasing average model sizes**
  - average model size is still increasing
  - input data today partly exceed 1GB



- **Increasing number of simulations**
  - more load cases
  - more vehicle models
  - more simulation disciplines
  - more …



- **Increasing throughput of simulations per user**
  - Individual users are doing more simulations

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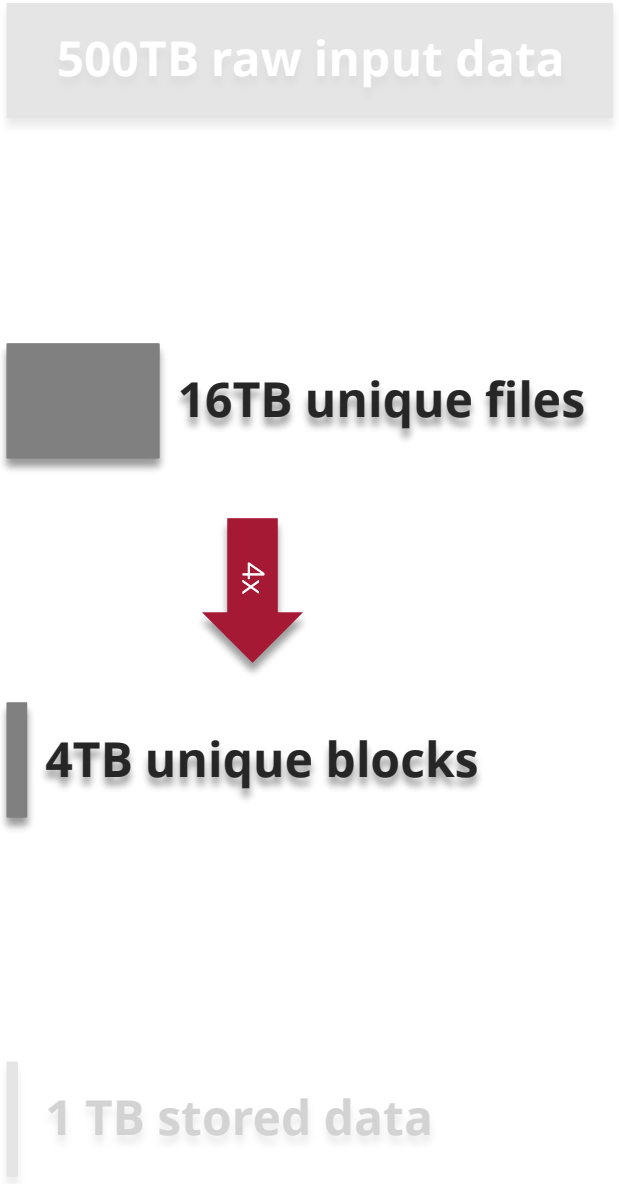
In development: *INPUT Data*

- File level Data Deduplication
  - each Simulation consists of multiple Files
  - changes for a simulation usually only affect a few files
  - only changed files are stored and transferred
  - savings approximately factor ~30
  - **standard in LoCo**

- Block level Data Deduplication
  - changes on simulation input usually affect only a few lines
  - file is separated into blocks
  - only changed blocks are stored and transferred
  - savings approximately factor ~4
  - **in development for LoCo** *(VAVID)*[1]

- Standard compression algorithms
  - simulation input files are usually ASCII
  - standard compression algorithms (e.g. zip, bzip, lzma) work best on ASCII data
  - savings approximately factor ~3
  - **standard in LoCo**



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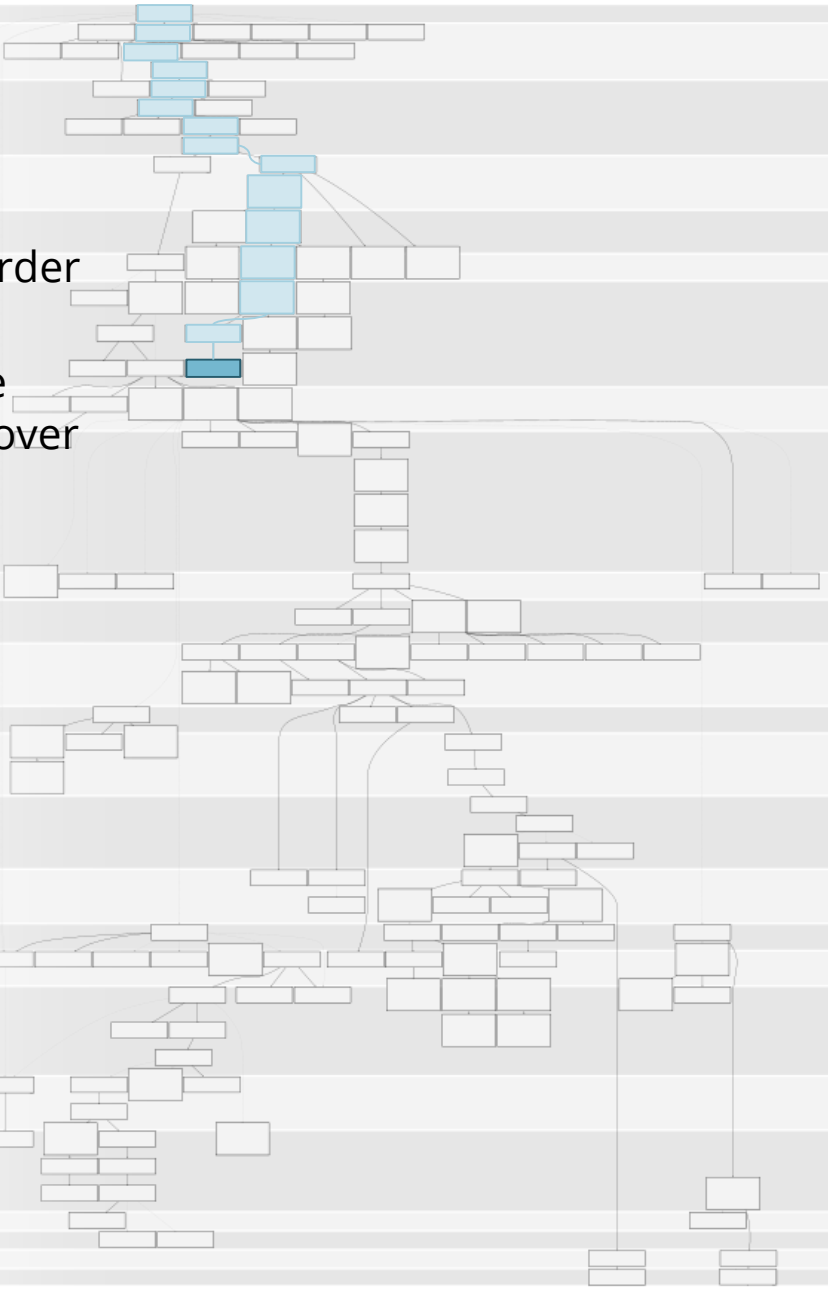
[1] VAVID - BMBF Big Data research program, http://www.pt-it.pt-dlr.de/de/3138.php

In development: *OUTPUT data*

Test Data

- one load case *(front wall)*
- 155 Results
- compressed with respect to history/order of creation
- Results are extracted from productive environment and have been created over a period of approximately 6 month



Results

FEMZIP-P		13,95 GB	
FEMZIP-E	FDB	0,85 GB	15%
	EFZ	5,00 GB	85%
	Total	5,85 GB	
FEMZIP-E + gzip		4,74 GB	

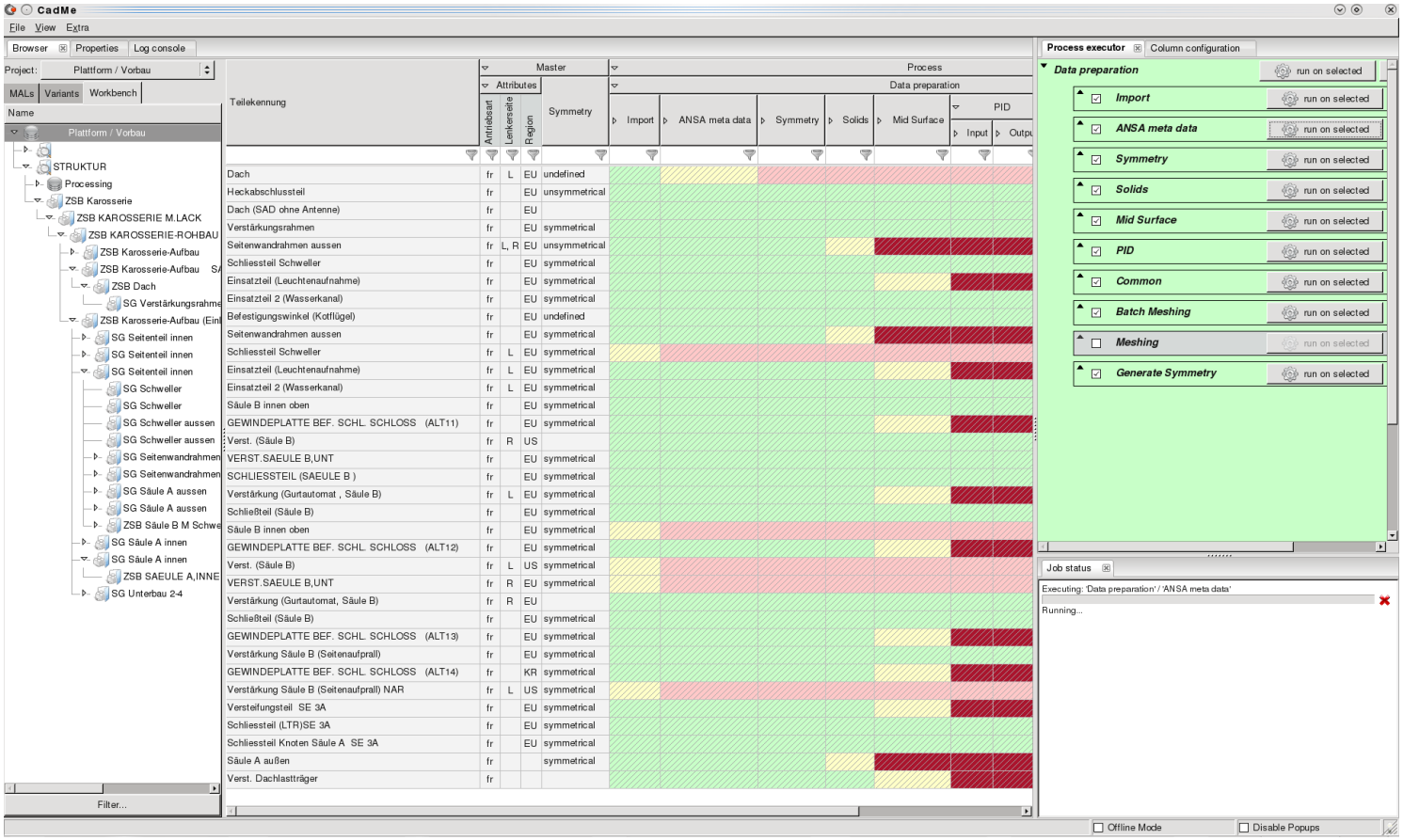
Factor P/E	**2,94***

* higher compression rates of up to factor 4 could be achieved when compressing all files at once

SCALE SIDACT GmbH

In development: *CAD/Meshing Integration*

- **CadMe:** plugin for LoCo to support meshing and other processes
- Import CAD-Part structures and geometry from PDM-Systems
- Integrate meshing tools *(e.g. ANSA)*
- Do collaborative work with multiple colleagues and see how far they got



LoCo-TDM Server

sync

LoCo Client
(with CadMe Plugin)

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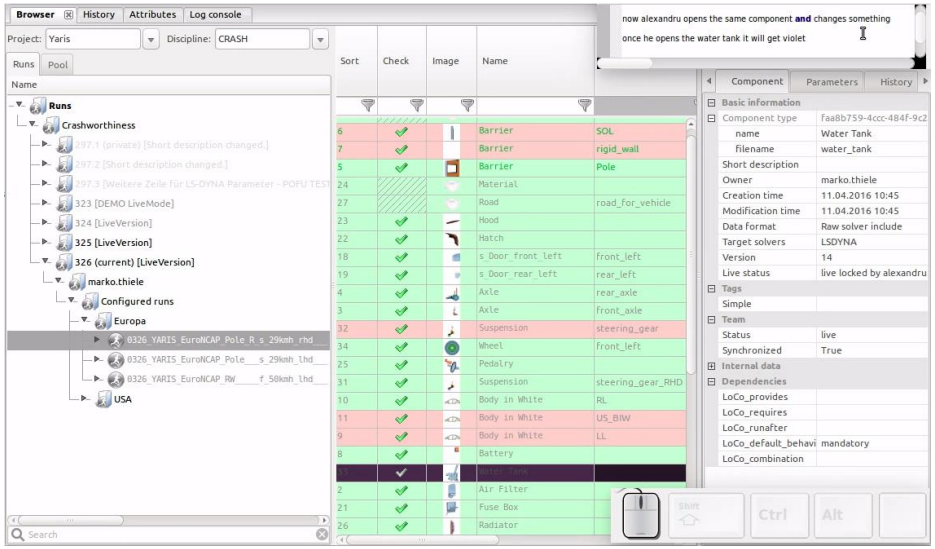
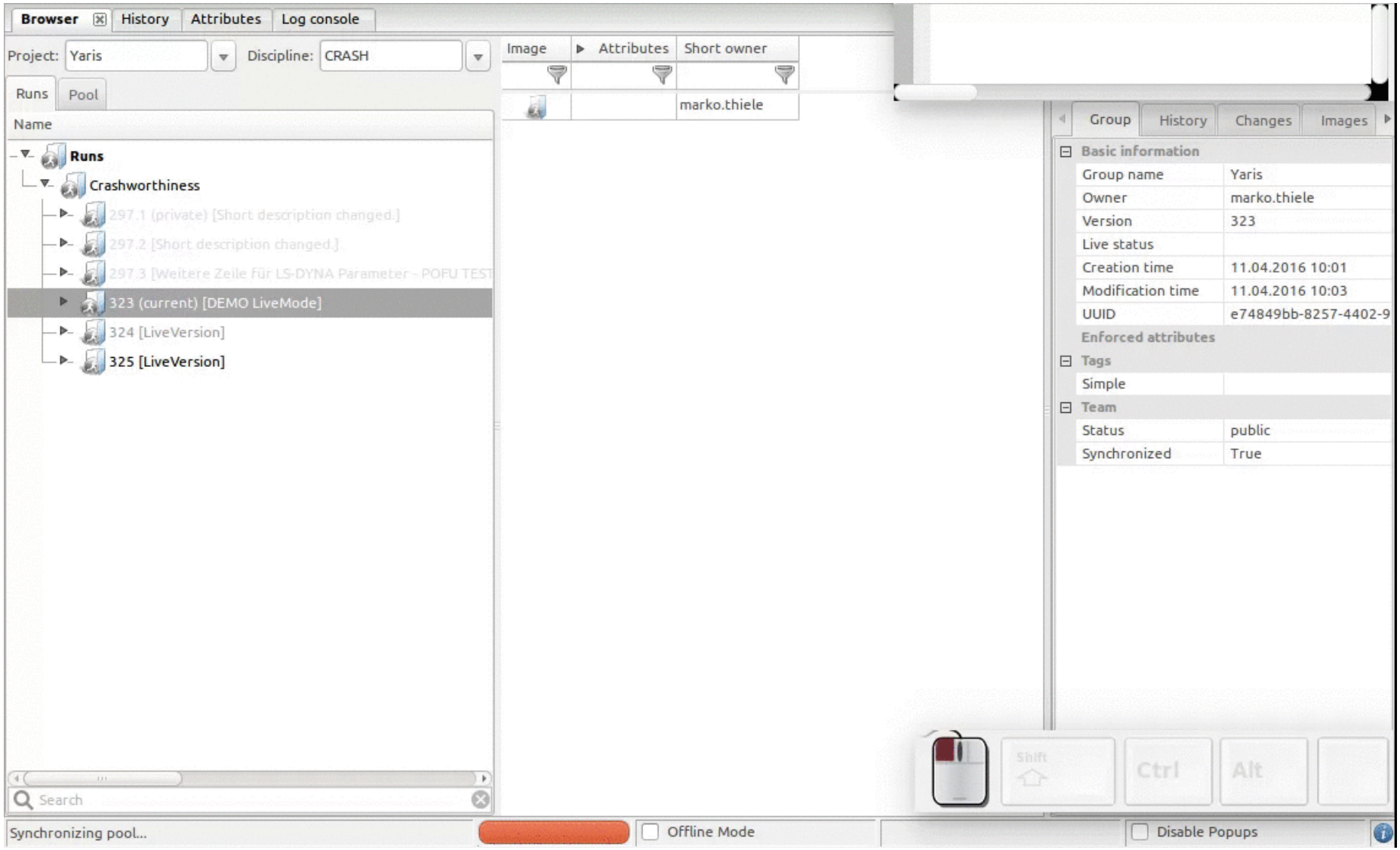
In development: *Live Mode*

- **UseCase: Initial Model Setup**
- **Live PoolVersions can be accessed by multiple users simultaneously**
- **Locking is managed by LoCo**
  - Objects can only be modified by one user at a time
  - Objects are locked automaticaly when files are opend
  - Locked objects are imideatly reconicable
  - Project managers can remove locks at any time
  - Assemblies are allways possible
- **Users have to be „online“ and connected to the server in order to use the LiveMode**



SCALE

In development: *Live Mode*



SCALE

Roadmap

Web Client

convenient access to data, particularly for monitoring

Integration with Collaboration and Ticket Systems

Jira, Open Project, … for SDM related task management

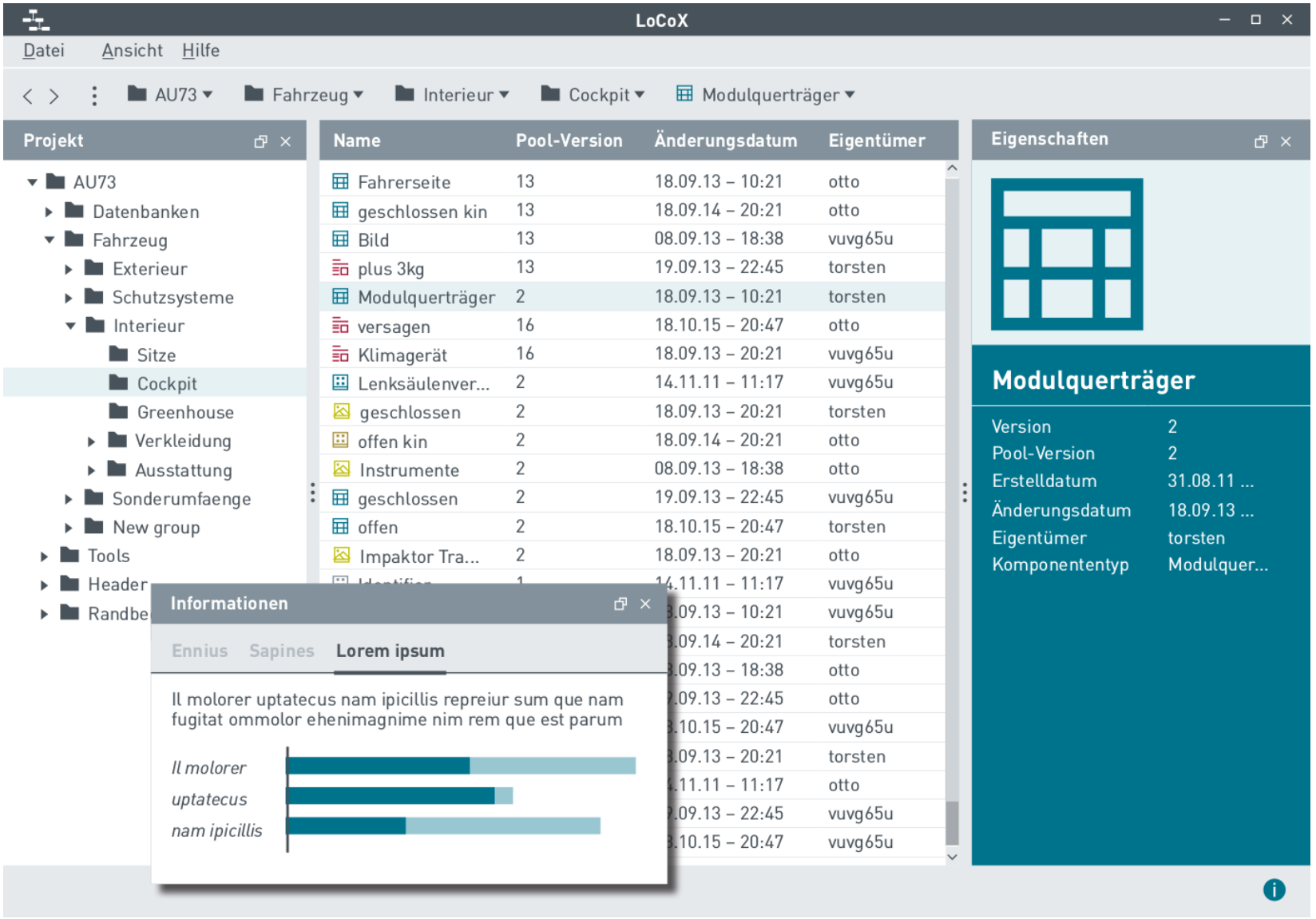
UI Redesign of SDM-Client

more intuitive, more efficient, more modern appeal

Vielen Dank!

SCALE

LoCoX


LoCoX
Datei
Ansicht
Hilfe
AU73
Fahrzeug
Interieur
Cockpit
Modulquerträger
Projekt
AU73
Datenbanken
Fahrzeug
Exterieur
Schutzsysteme
Interieur
Sitze
Cockpit
Greenhouse
Verkleidung
Ausstattung
Sonderumfaenge
New group
Tools
Header
Randbe
Name
Pool-Version
Änderungsdatum
Eigentümer
Fahrerseite 13 18.09.13 – 10:21 otto
geschlossen kin 13 18.09.14 – 20:21 otto
Bild 13 08.09.13 – 18:38 vuvg65u
plus 3kg 13 19.09.13 – 22:45 torsten
Modulquerträger 2 18.09.13 – 10:21 torsten
versagen 16 18.10.15 – 20:47 otto
Klimagerät 16 18.09.13 – 20:21 vuvg65u
Lenksäulenver... 2 14.11.11 – 11:17 vuvg65u
geschlossen 2 18.09.13 – 20:21 torsten
offen kin 2 18.09.14 – 20:21 otto
Instrumente 2 08.09.13 – 18:38 otto
geschlossen 2 19.09.13 – 22:45 vuvg65u
offen 2 18.10.15 – 20:47 torsten
Impaktor Tra... 2 18.09.13 – 20:21 otto
Informationen
Ennius
Sapines
Lorem ipsum
Il molorer uptatecus nam ipicillis repreiur sum que nam fugitat ommolor ehenimagnime nim rem que est parum
Il molorer
uptatecus
nam ipicillis
Eigenschaften
Modulquerträger
Version 2
Pool-Version 2
Erstelldatum 31.08.11 ...
Änderungsdatum 18.09.13 ...
Eigentümer torsten
Komponententyp Modulquer...

SCALE