Recent Developments in LoCo

Instant Collaboration in Simulation Data Management

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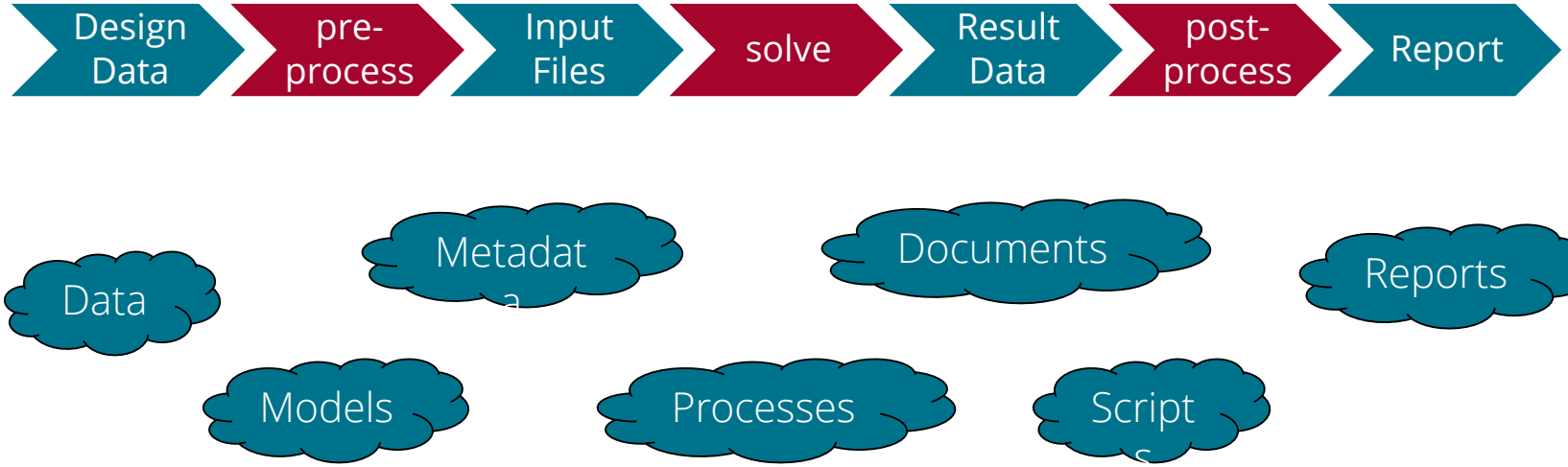
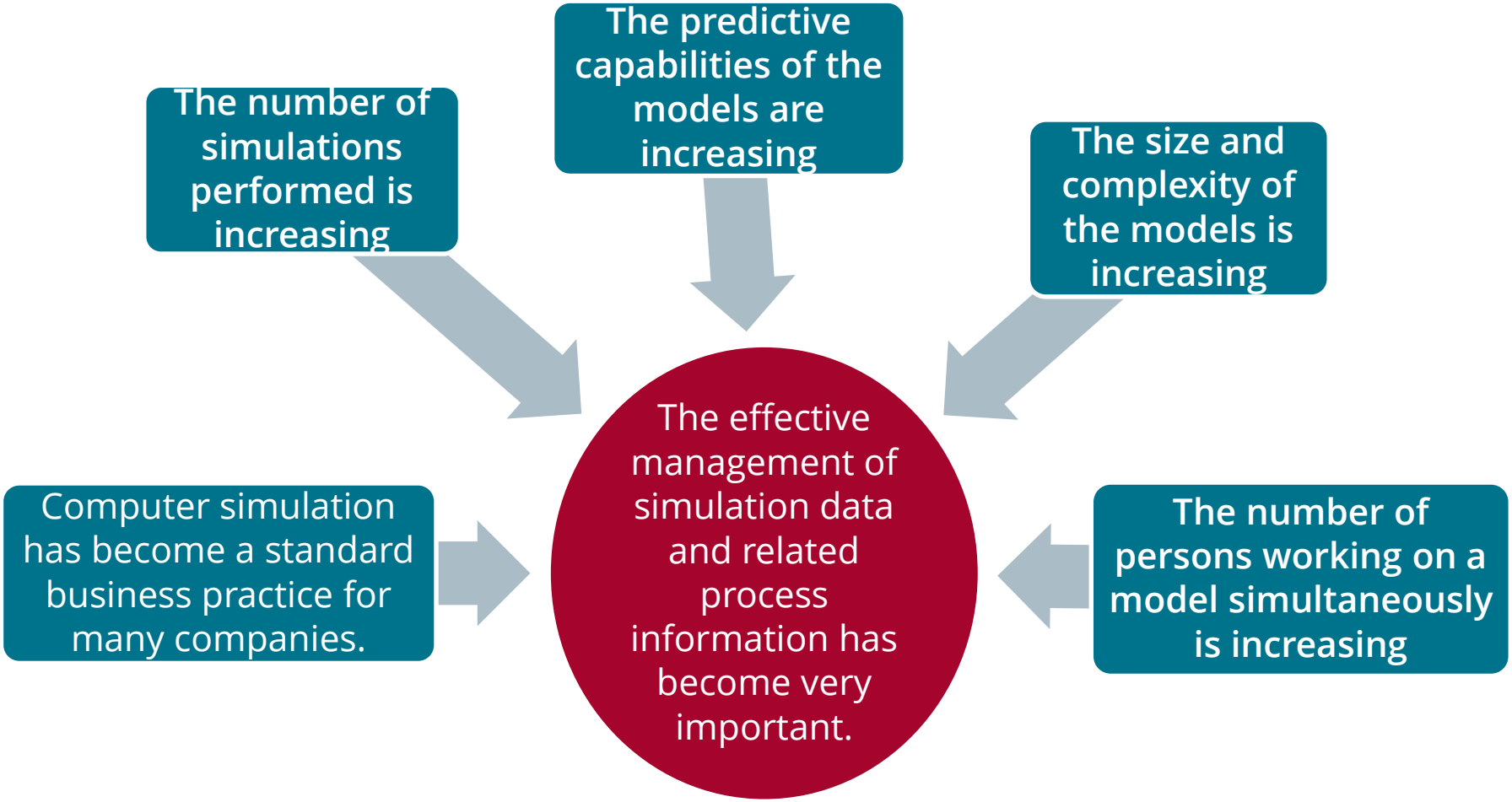
A general introduction to LoCo is part of our workshop starting at 10:40 in this room.

What is Simulation Data Management?

- **“Simulation Data Management” (SDM) is a technology which uses database solutions to manage simulation and related process data across the product lifecycle.**
- The SDM System contains all data that is considered relevant to the simulation process.



Why Simulation Data Management?



SCALE – IT Solutions for CAE

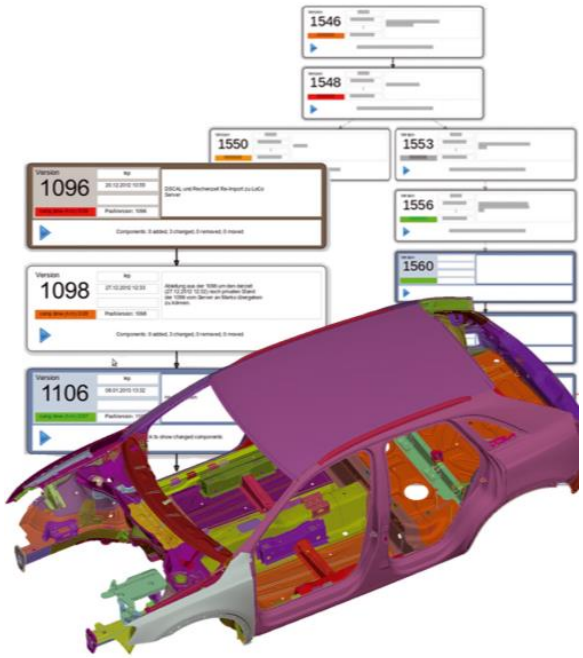
- SCALE is a 100% subsidiary of DYNAmore.
- Dedicated to CAE process-, and data management.
- Staff: 35 experienced CAE engineers and professional computer scientists.
- Offices in Germany: Stuttgart, Ingolstadt, Dresden.

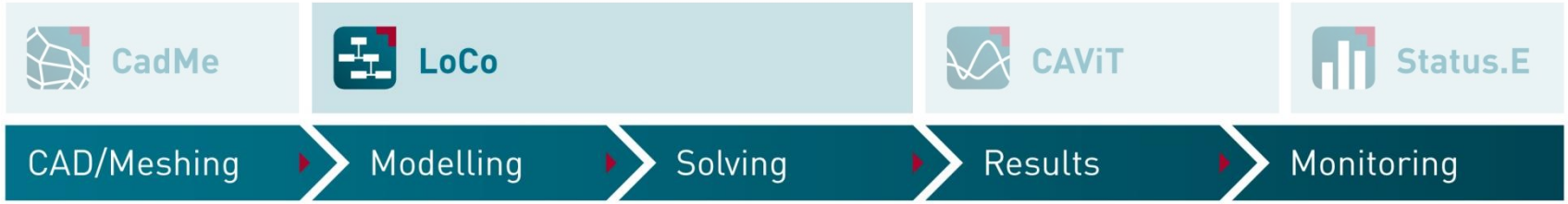
- SCALE has developed a comprehensive simulation and test data framework (SCALE.sdm) in close collaboration with AUDI, Porsche and the Volkswagen Group.
- Several Apps cover the entire CAE design process.

- The system has more than 800 registered users.
- This presentation focuses on LoCo – SCALE's software for simulation data management.
- LoCo is solver independent.

Simulation Data Management with LoCo

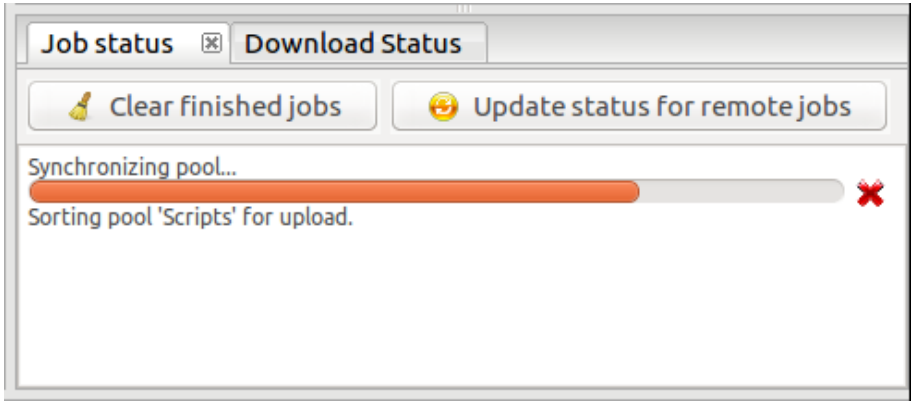
- **LoCo applies several new approaches to SDM:**
  - offline capabilities
  - automatic synchronization of relevant data
  - comprehensive version control
  - novel approaches for the assembly of models
  - ...
- **LoCo is an open system that allows the integration of any third party or in-house CAE-product.**
- **LoCo's three main tasks are:**
  - Data distribution
  - Model Assembly
  - Version Control

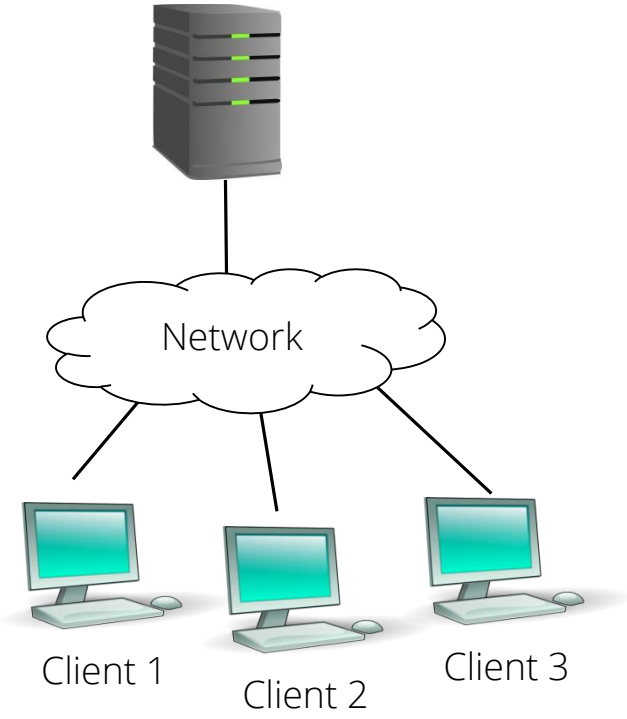




LoCo: Data Distribution

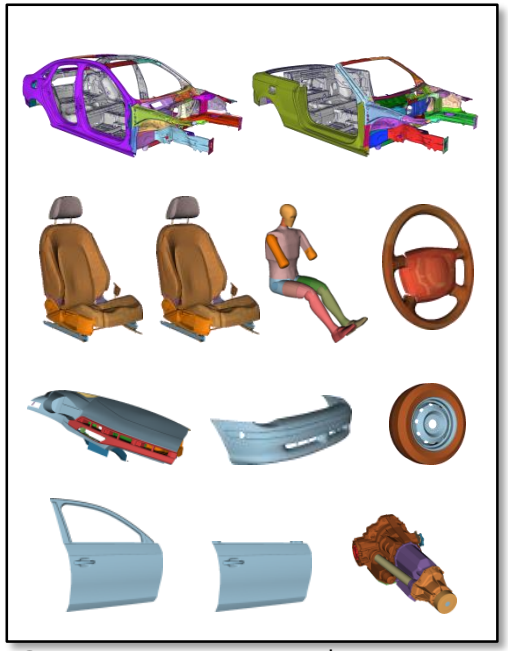
- **LoCo is a Server-Client-System.**
- **Data distribution is based on the idea of local synchronization of relevant data.**
  - Access to synchronized data is very fast
  - The LoCo client is operational even when the user is offline.





LoCo: Model Assembly

- **LoCo promotes a modular modelling strategy**
  - Sharing of workload and responsibility for modules
  - Modules can be reused
- **The LoCo assembly process is based on attributes**
  - Every component carries information about itself in the form of attributes
  - LoCo uses this information to assemble model configurations and load cases

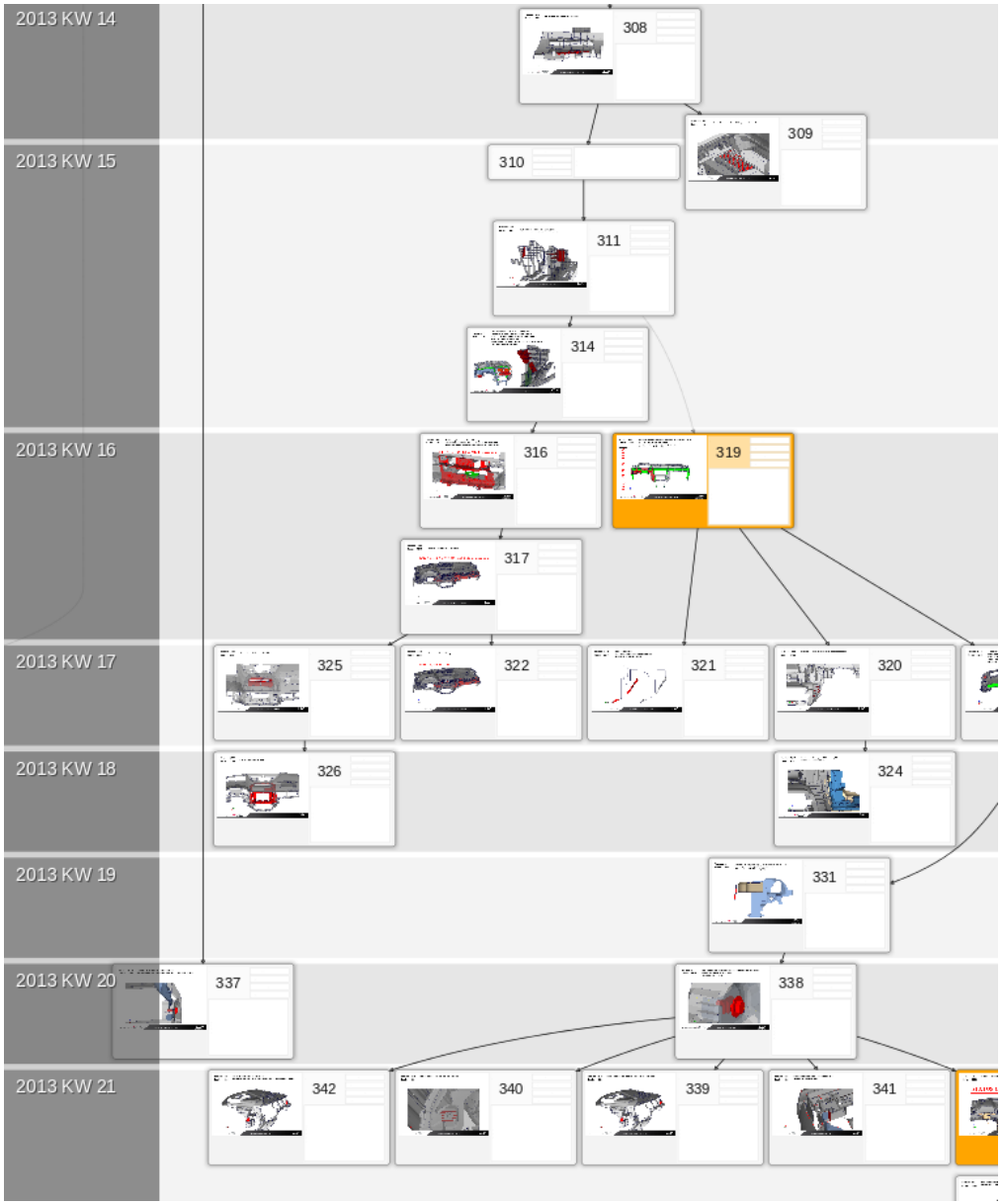


Component Pool

Assembly of multiple model configurations and load cases

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 files simultaneously
- **In LoCo every object is versioned:**
  - Modules
  - Groups
  - Simulation Runs
  - Parameters
  - Scripts
  - Meshes
  - ...



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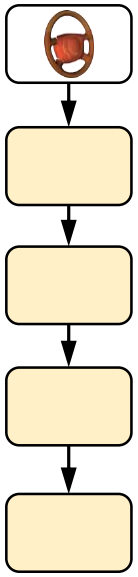
Version Control: Lock-Modify-Unlock vs. Copy-Modify-Merge

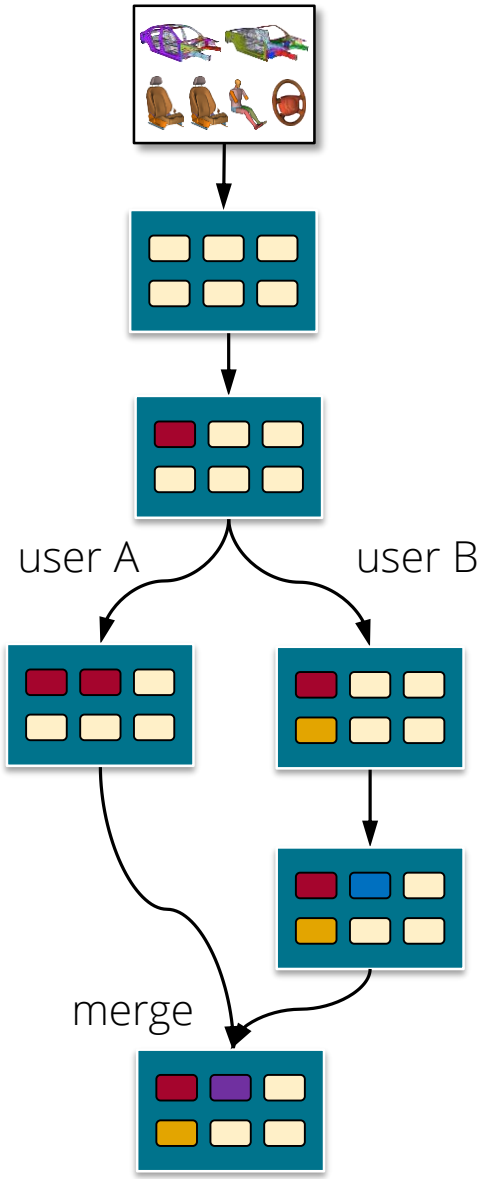
Lock-Modify-Unlock

- Components are first locked, then modified and finally unlocked again.
- While the component is locked, other users are prevented from modifying the same component.
- Easy to understand.
- Always consistent data.
- Users may have to



Copy-Modify-Merge

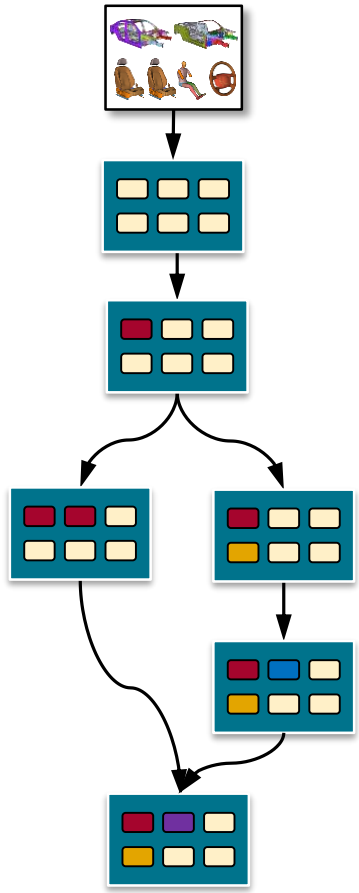
- Each users works with a complete, independent copy of all data.
- Users can make changes to the same component simultaneously.
- At some point different “branches” need to be merged.

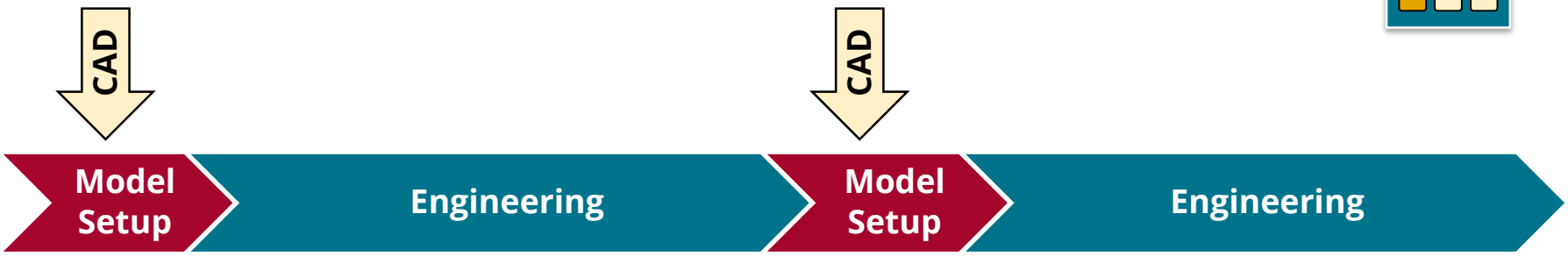


LoCo is based on the copy-modify-merge approach, as it is the natural choice for an environment in which individual engineers must be able to observe the effects of their own changes in isolation from the work of others.

Version Control during Model Setup

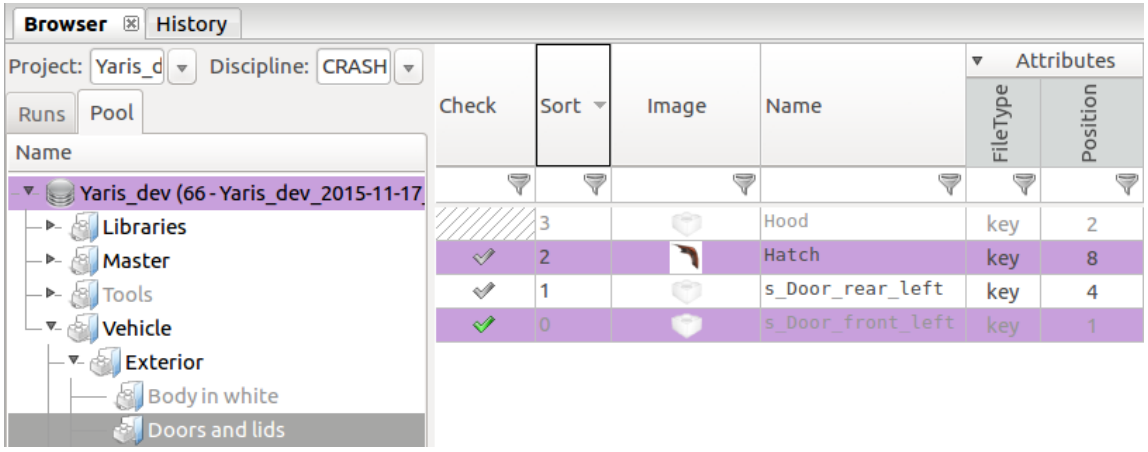
- **In the end of 2015 Porsche confronted us with the following analysis:**
  - The vehicle development process has several “model setup phases”.
  - During these phases, the argument for “copy-modify-merge” does not hold.
  - There is no need for the individual engineers to observe the effects of their own changes in isolation.
  - Ideally, each team member should be able to instantly see and use the changes made by other team members.
  - The model setup team wants to work with a lock-modify-unlock approach.
- **A new feature designated "LiveMode" was introduced in LoCo in the end of 2016.**

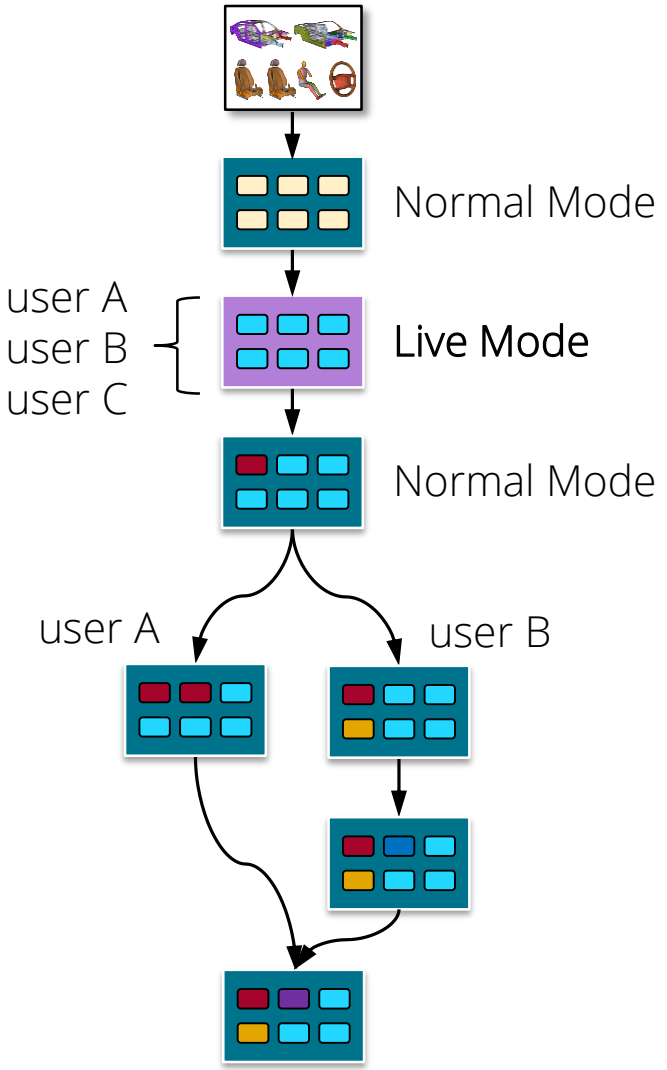




Live Mode

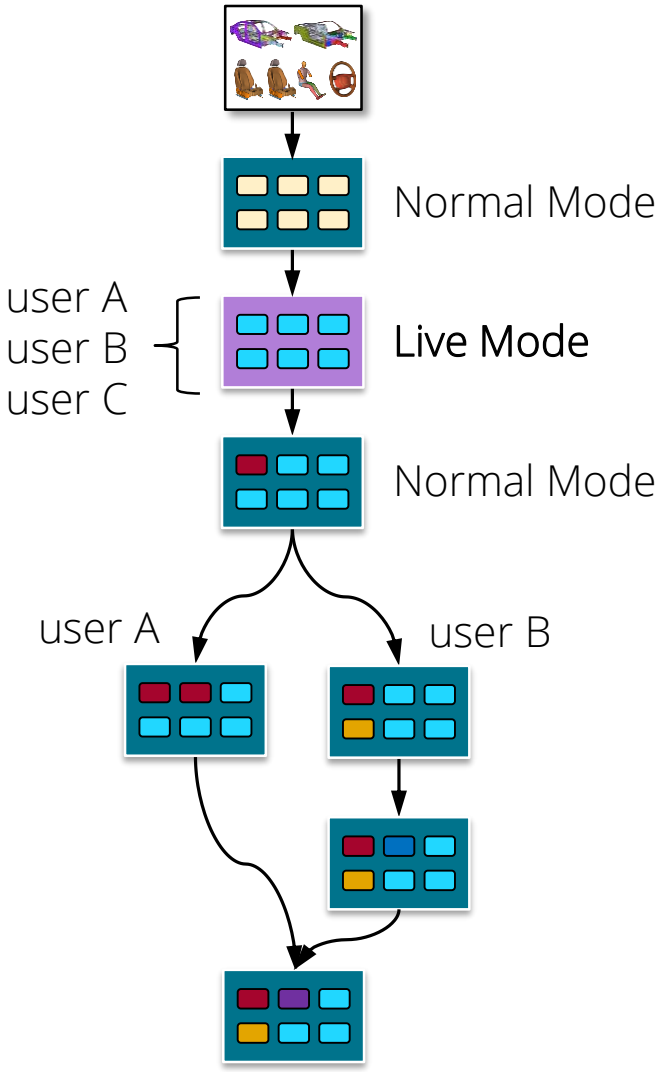
- The Live Mode feature allows to seamlessly switch between copy-modify-merge (normal mode) and lock-modify-unlock (live mode).
- In live mode all users can access and work on the same version of the model.
- Components are automatically locked and released.
- Upload and download of data is handled by a synchronization mechanism in the background.
- Changes made in live mode are not documented to the same degree of detail as in normal mode (→ model setup).

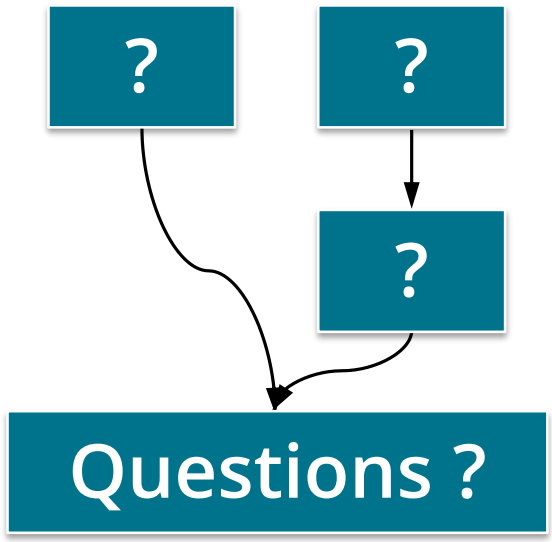




Live Mode: Feedback

- **Live Mode for introduced in January 2017.**
- **Feedback is very positive.**
- **Criticism: Responsiveness of the graphical user interface in live mode.**
- **Besides the "model setup use case" the live mode is also used as an instant collaboration tool.**
  - User A calls user B and asks for help.
  - User A switches his current model to live mode, allowing user B access to the same set of data.
  - The two users solve the problem collaboratively.
  - User A switches back to normal mode.





Thank you for your attention!

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