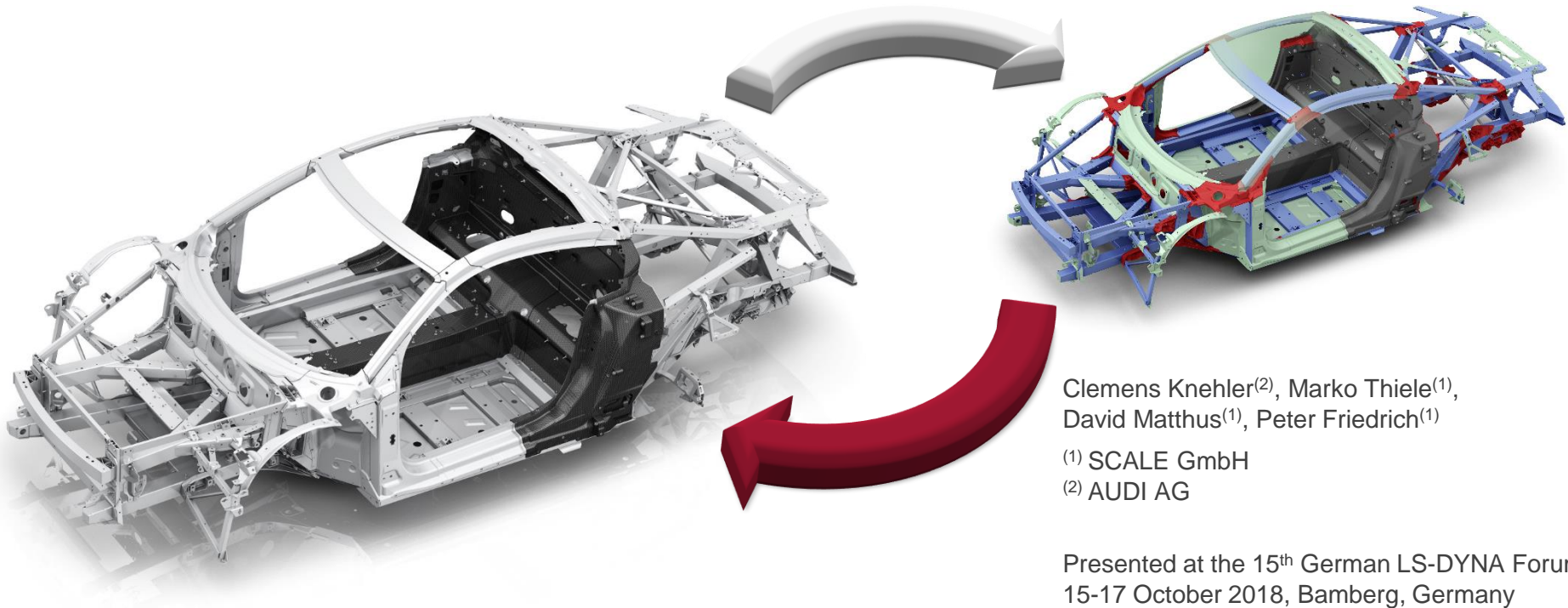




Audi

# Prospects of integrating CAD and CAE in Simulation Data Management



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<sup>(2)</sup> AUDI AG

Presented at the 15<sup>th</sup> German LS-DYNA Forum  
15-17 October 2018, Bamberg, Germany

# Agenda

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- Integrating CAD and CAE

- Body18 “Proof of Concept” at AUDI



- Proposed Approach

- Data structure
- Handling of connection information

- Implementation of Body18 “Proof of Concept”

- Integration of CATIA for CAD and ANSA for CAE
- Closing the gap between CAD and CAE
- Crafting simulations for different solvers and disciplines on the same data
- Project management



- Roundup

- Outlook

# Agenda

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## Integrating CAD and CAE

- Body18 “Proof of Concept” at AUDI



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  - Data structure
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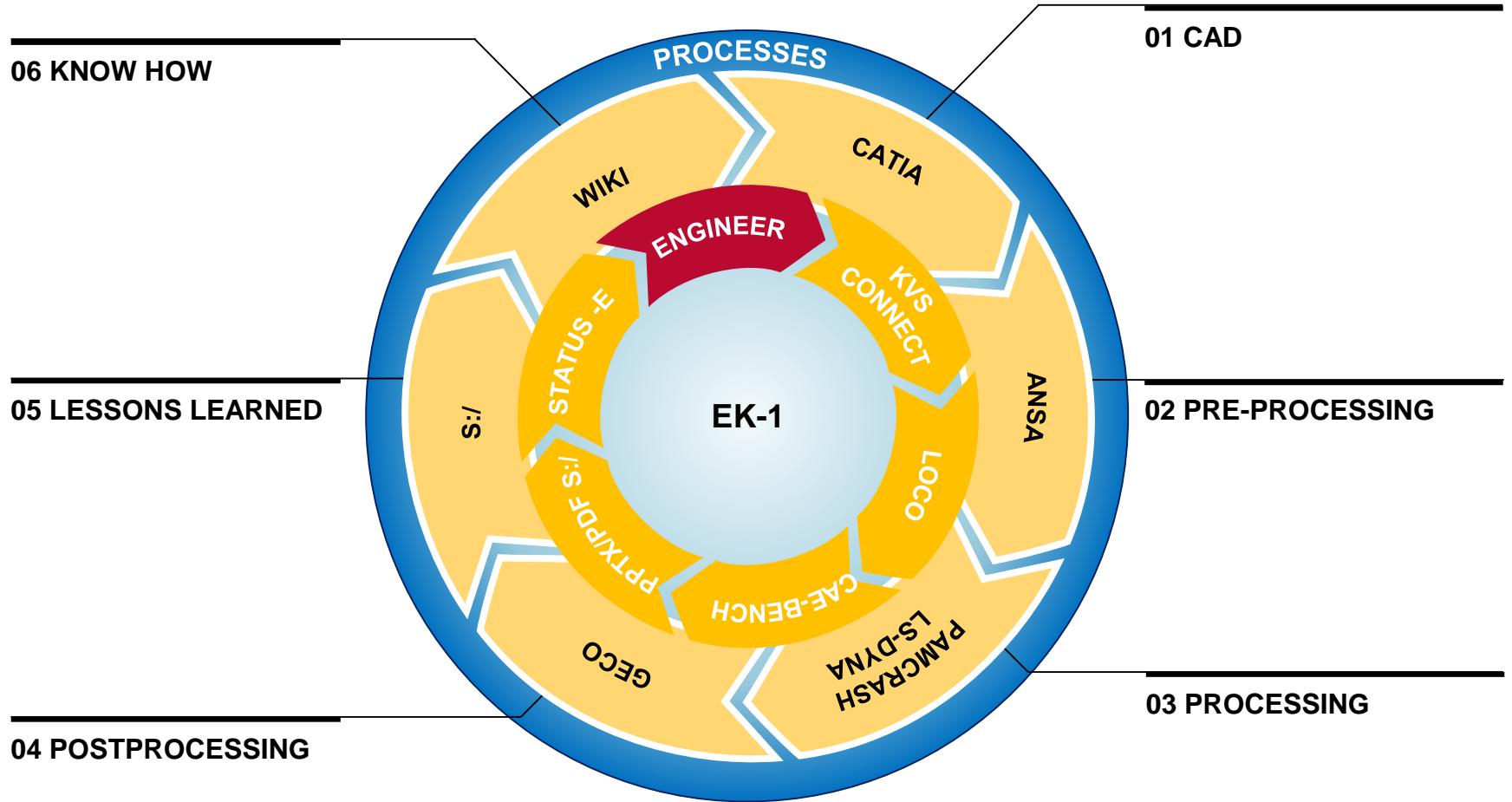


- Roundup
- Outlook

# Integrating CAD and CAE - *motivation for Body18*

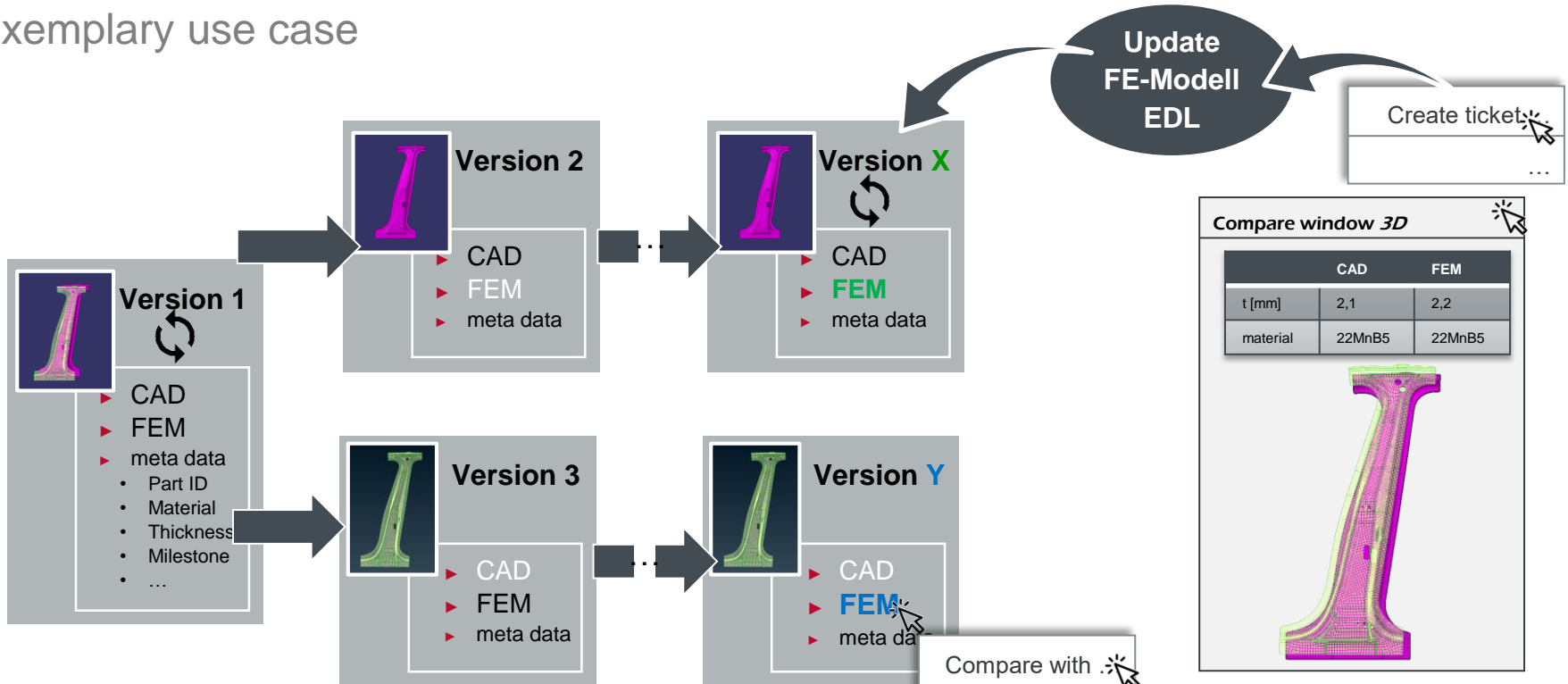


- TOOL GENERATE DATA
- TOOL STORE DATA



# Integrating CAD and CAE - *motivation for Body18*

exemplary use case



- goal: < 30s
- currently: 10min - 30min
  - Search part ID
  - Download part from PDM to local disk
  - Load geometry in ANSA
  - Lookup CAD attributes in CATIA or some Excel sheet
  - Write E-Mail or call engineering service supplier to assign next task
  - Send data to engineering service supplier through data exchange platform

# Agenda

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- Integrating CAD and CAE

## Body18 “Proof of Concept” at AUDI



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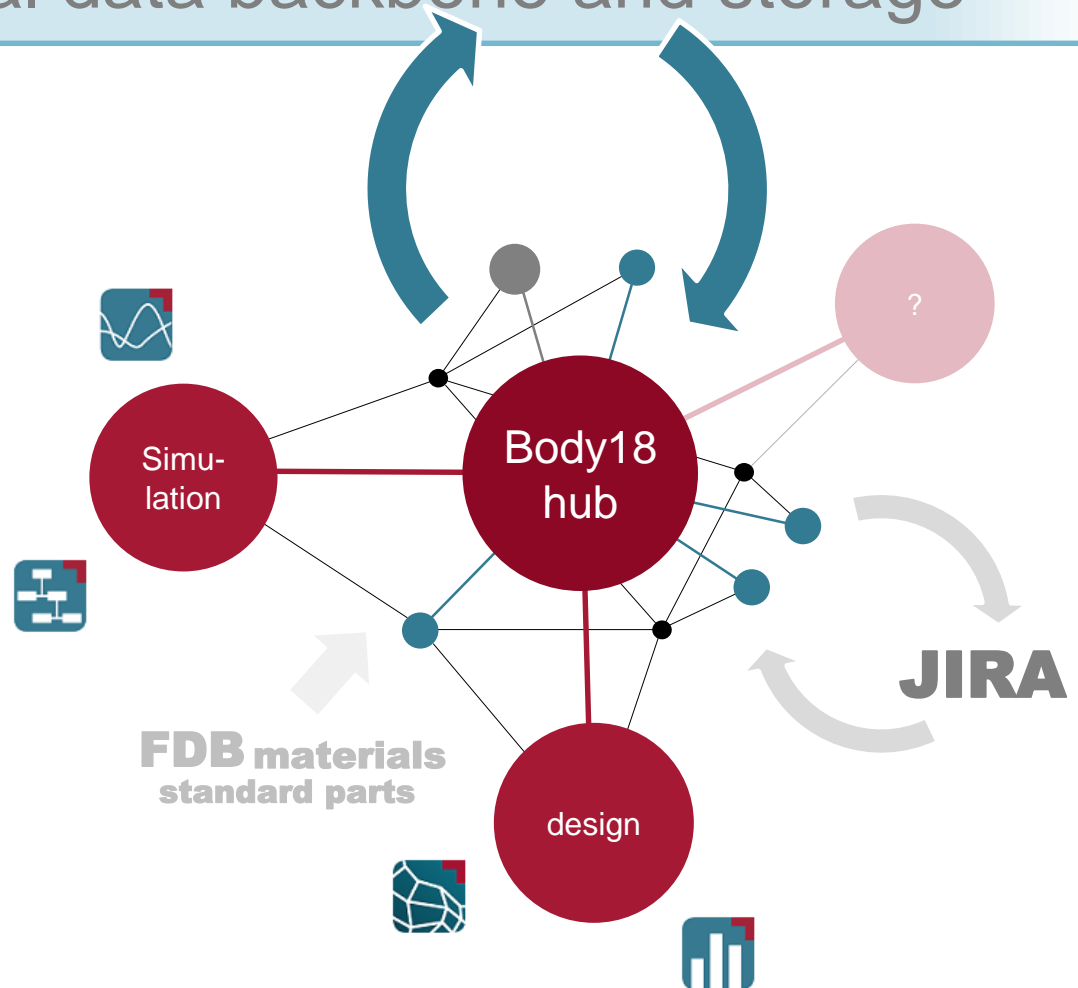




## PDM / CONNECT

central data backbone and storage

- Supplement existing PDM with team collaboration
- Focus
  - Instant collaboration
  - Integrate CAD and CAE apps
  - Seamless data integration between CAD and CAE
  - Integration of project management system (*JIRA*)
- Create common platform to integrate further apps

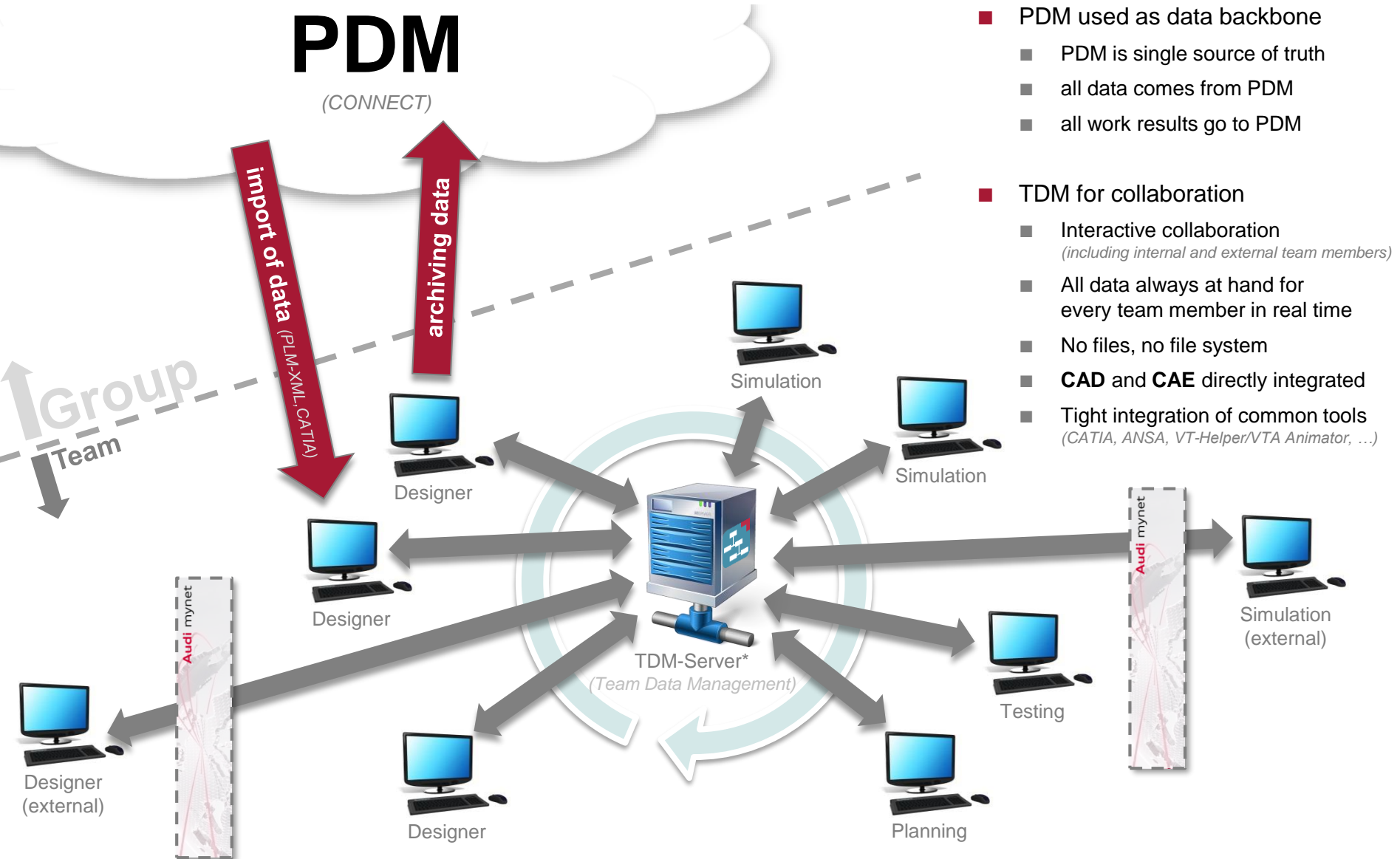


# Body18 "Proof of Concept" at AUDI - setup



## PDM

(CONNECT)



- PDM used as data backbone
  - PDM is single source of truth
  - all data comes from PDM
  - all work results go to PDM
- TDM for collaboration
  - Interactive collaboration (including internal and external team members)
  - All data always at hand for every team member in real time
  - No files, no file system
  - **CAD and CAE** directly integrated
  - Tight integration of common tools (CATIA, ANSA, VT-Helper/VTA Animator, ...)



# Agenda

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- Integrating CAD and CAE

- Body18 “Proof of Concept” at AUDI



## Proposed Approach

- Data structure
- Handling of connection information

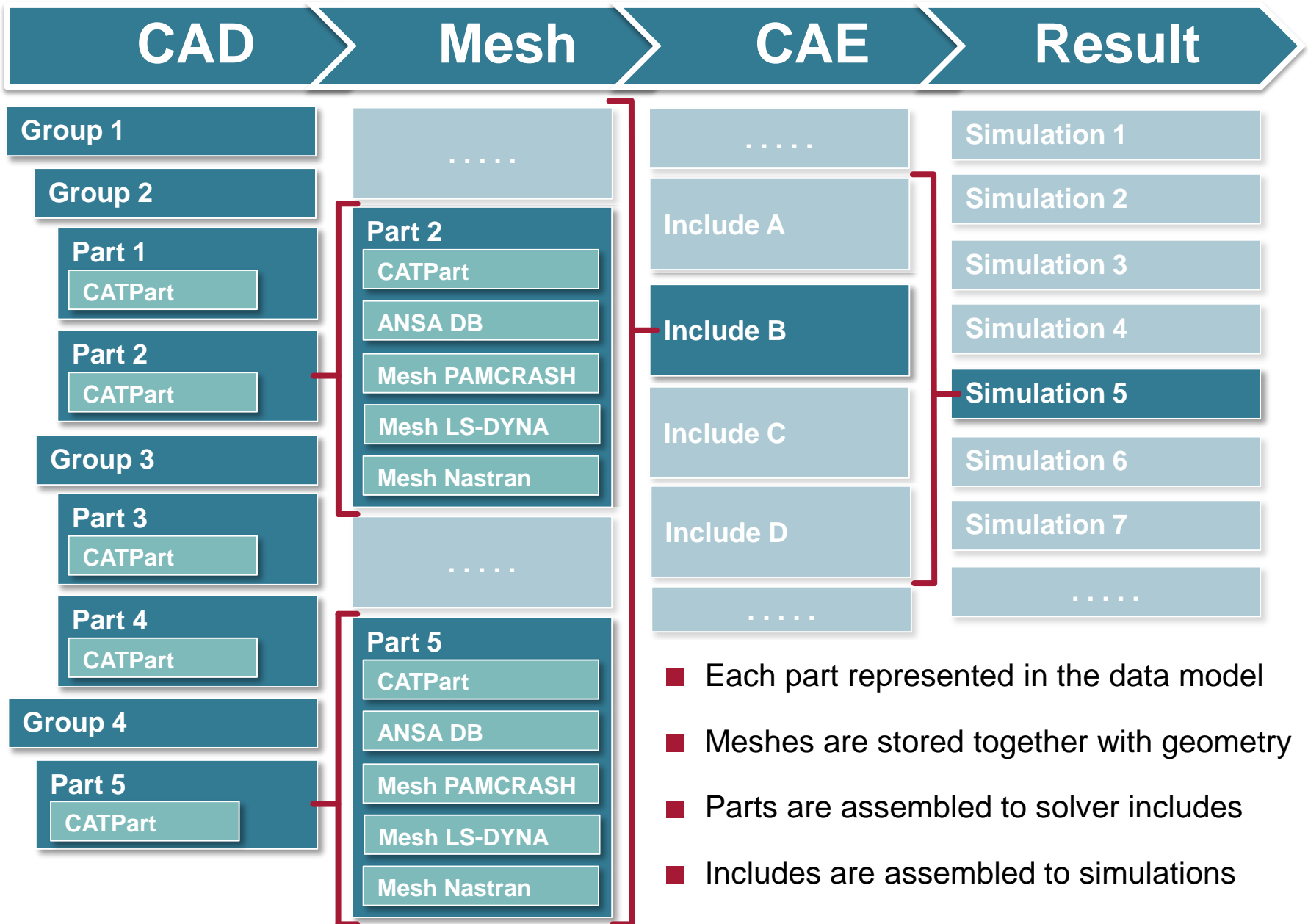
- Implementation of Body18 “Proof of Concept”

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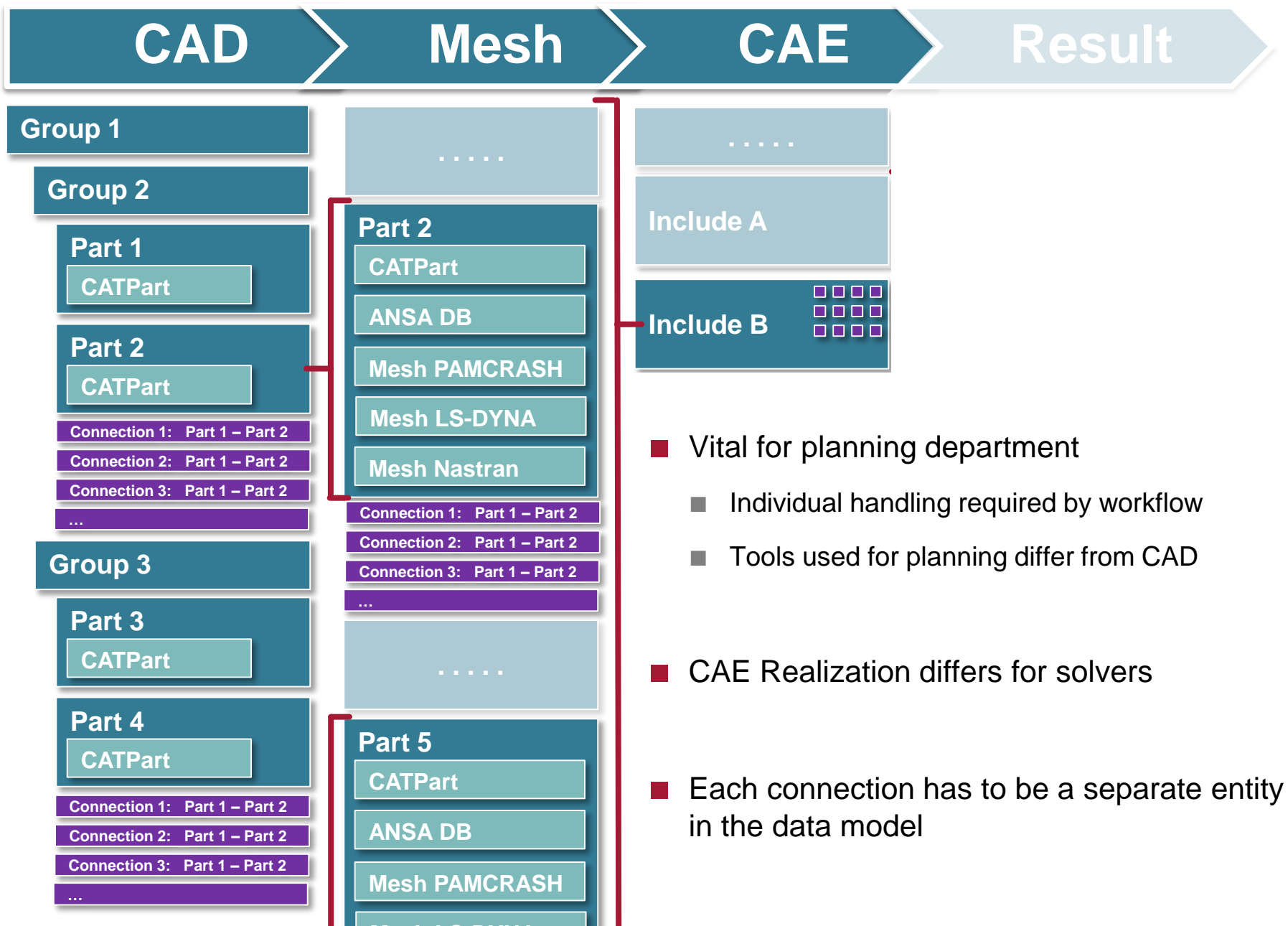


- Roundup
- Outlook

# Proposed Approach - *data model*



# Proposed Approach - *connection information*



- Vital for planning department
  - Individual handling required by workflow
  - Tools used for planning differ from CAD
- CAE Realization differs for solvers
- Each connection has to be a separate entity in the data model

# Agenda

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- Integrating CAD and CAE

- Body18 “Proof of Concept” at AUDI



- Proposed Approach

  - Data structure

  - Handling of connection information

- **Implementation of Body18 “Proof of Concept”**

  - Integration of CATIA for CAD and ANSA for CAE

  - Closing the gap between CAD and CAE

  - Crafting simulations for different solvers and disciplines on the same data

  - Project management



- Roundup

- Outlook

CAD

Mesh

CAE

Result

Group 1

Group 2

Part 1

CATPart

Part 2

CATPart

Connection 1: Part 1 – Part 2

Connection 2: Part 1 – Part 2

Connection 3: Part 1 – Part 2

...

Group 3

Part 3

CATPart

Part 4

CATPart

Connection 1: Part 1 – Part 2

Connection 2: Part 1 – Part 2

Connection 3: Part 1 – Part 2

...

## Challenges

- Simultaneous editing in CATIA by multiple team members
- Handling of connections and metadata directly in TDM
- Changes made in TDM have to be reflected in CATIA and vice versa
- Fast loading into CATIA
- .....

mesh PAMCRASH

# Implementation - CATIA

Body18

product structure from CATIA

Name	Short description	PR-Familie_KAR	PR-Familie_KSA	File Type	MaterialID	Nummer
AUTS_AUS1516		K41	SC3	CATPart		
CAD_#KE_810_553_PCA_TM_015	VERSTAERKUNG_DACHR_VFF_170519QCS1	K41		CADPart		KE_810_553_1,8mm
CAD_#KE_809_655_B_PCA_TM_002	ET_SCHARNIERAU_HRL_NS_180119QCS1	K41		CADPart		KE_809_655_B_1,2mm
CAD_#KE_806_207_PCA_TM_002	VERST_SCHARNIERAUFP_NS_180119QCS1	K41		CADPart		KE_806_207_1,5mm
CAD_#KE_809_745_PCA_TM_022	VERST_SAEULE_C_OBE_VFF_170419QCS1	K41		CADPart	CR300L4G40/40-U	KE_809_745_0,9mm
CAD_#KE_809_263_G01_TM_018	VERST_SAEULE_C_UNT_VFF_170419QCS1	K41, K5B		CADPart	CR300L4G40/40-U	KE_809_263_0,9mm
CAD_#KE_809_697_DMU_TM_006	SCHOTT_SA_C_LIN_BI_SKA_R08_CH01093037	K41		CADPart	PE-Copolymerisat	KE_809_697_1,5mm
CAD_#KE_810_391_A_G01_TM_001	VERL_SAEULE_A_AUSS_VFF_170419QCS1	K41		CADPart	CR3301590T-DP-GI40/40-U	KE_810_391_A_0,8mm
CAD_#KE_810_889_DMU_TM_004	SCHOTT_SAEUL_D_M_SKA_R05_CH01093043	K41		CADPart	PE-Copolymerisat	KE_810_889_1,5mm
CAD_#KE_809_647_DMU_TM_008	SCHOTT_SAEUL_C_MIT_SKA_R08_CH01093036	K41		CADPart	PE-Copolymerisat	KE_809_647_1,5mm
CAD_#KE_809_697_A_DMU_TM_005	SCHOTT_SA_C_LIN_AU_SKA_R06_CH01093038	K41		CADPart	PE-Copolymerisat	KE_809_697_A_1,5mm
CAD_#KE_809_307_G01_TM_020	VERST_SAEULE_D_VFF_170505QCS1	K41		CADPart	CR4-GI40/40-U	KE_809_307_0,7mm
CAD_#KE_806_095_PCA_TM_014	SCHOTTTEIL_SAEULE_BFG_170120QCS1	K41		CADPart	CR240LA-GI40/40-U	KE_806_095_1,1mm
CAD_#KE_809_329_PCA_TM_014	SAEULE_D_INNEN_LINT_VFF_170519QCS1	K41		CADPart	CR4-GI40/40-U	KE_809_329_0,7mm
CAD_#KE_810_555_PCA_TM_009	VERST_DACHREILING_VFF_170420QCS1	K41		CADPart	CR240LA-GI40/40-U	KE_810_555_1,8mm
CAD_#KE_810_283_G01_TM_023	SAEULE_A_AUSS_OBEH_PVS_170922QCS1	K41		CADPart	2294-ES-A560/60	KE_810_283_1,65mm
CAD_#KE_809_111_PCA_TM_020	VERSTEUFGUNSTE_KFB_BFG_170120QCS1	K41, K5B		CADPart	CR240LA-GI40/40-U	KE_809_111_1,2mm
CAD_#KE_805_523_PCA_TM_014	SCHOTTTEIL_VERL_BFG_170120QCS1	K41, K5B		CADPart	CR240LA-GI40/40-U	KE_805_523_1,2mm
CAD_#KE_809_571_DMU_TM_003	SCHOTT_SAEUL_U_AU_SKA_R05_CH01093046	K41, K5B		CADPart	PE-Copolymerisat	KE_809_571_1,5mm
CAD_#KE_809_285_G01_TM_009	VERST_SAEULE_A_MI_BFG_170120QCS1	K41, K5B		CADPart	CR240LA-GI40/40-U	KE_809_285_1,4mm
CAD_#KE_809_625_A_G01_TM_007_033	SCHARNIERVERST_BFG_170127QCS1	K41, K5B		CADPart	HX340LAD-z100M80	8W0_809_625_A_
CAD_#KE_810_215_G01_TM_014	SCHARNIERVERSTAERK_PVS_170714QCS1	K41, K5B		CADPart	CR380LA-GI40/40-U	KE_810_215_
CAD_#KE_809_297_PCA_TM_020	SCHARNIERVERST_S_PVS_170630QCS1	K41, K5B		CADPart	CR3301590T-DP-GI40/40-U	KE_809_297_
CAD_#KE_810_313_PCA_TM_017	STEGTEIL_SAEULE_C_VFF_170526QCS1	K41, K5B		CADPart	CR440Y780T-DP-EG47/47	KE_810_313_0,9mm
CAD_#KE_809_695_PCA_TM_013	VERST_SCHWELLER_2_VFF_170526QCS1	K41, K5B		CADPart	CR3301590T-DP-EG47/47	KE_809_695_2,1mm
CAD_#KE_809_393_PCA_TM_015	VERST_SCHWELLER_3_VFF_170526QCS1	K41, K5B		CADPart	CR3301590T-DP-EG47/47	KE_809_
CAD_#KE_809_067_PCA_TM_009	VERST_SCHWELLER_VO_VFF_170303QCS1	K41, K5B		CADPart	CR3301590T-DP-GI40/40-U	KE_809_
CAD_#KE_809_755_G01_TM_016	SCHWELLER_AUSSEN_VFF_170602QCS1	K41, K5B		CADPart	CR7001980T-DP-GI40/40-U	KE_809_
CAD_#KE_810_269_G01_TM_016	STEG_SCHWELLER_VO_PVS_170602QCS1	K41, K5B		CADPart	CR7001980T-DP-GI40/40-U	KE_810_
CAD_#KE_809_739_G01_TM_021	VERSTAERKUNG_INNEN_VFF_170602QCS1	K41, K5B		CADPart	CR7001980T-DP-EG47/47	KE_809_
CAD_#KE_809_801_DMU_TM_005	SCHOTT_SCHWELL_M_SKA_R05_CH01093040	K41, K5B		CADPart	PE-Copolymerisat	KE_809_

CAD parts

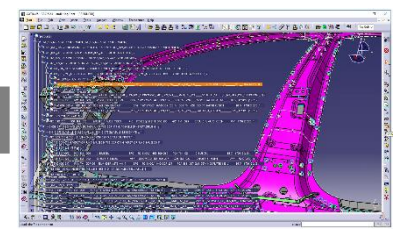
CAD meta data

working with CAD data

CATIA V5

control of variants

CATIA V5



PDM System (CONNECT)



# Implementation - handling CAD data

**version control**

Components (PV:162)

Name

- #KE\_809\_039 G:SEITENTEIL\_INNEN
  - #KE\_809\_045 G:SEITENWANDRAHMEN HINTEN INNEN
    - #KE\_809\_051 G:SEITENTEIL HINTEN INNEN
      - #KE\_806\_241\_B G:AUFNAHME SCHARNIER
        - #KE\_809\_453 G:EINSATZTEIL
        - #KE\_810\_417 G:VERSTAERKUNG DACHREILING
      - #KE\_809\_737 Z:VERST\_SAEULE C
        - #KE\_809\_027 G:SAEULE D
          - #KE\_809\_521 G:VERSTAERKUNG DACHREILING
        - #KE\_809\_201 G:SAEULE A,AUSSEN
          - #KE\_809\_055 Z:SAEULE A,UNT,AUSS
            - #KE\_809\_293\_A G:SCHARNIERVERSTAERK SAEULE A OBEN LI.
            - #KE\_810\_209 G:SCHARNIERVERSTAERK UNTEN LINKS
          - #KE\_809\_109 G:VERSTEIFUNGSTEIL
          - #KE\_809\_377 G:SCHWELLER VERSTAERKUNG
          - #KE\_809\_597 G:STEGTEIL,SCHWELLER SG OBEN
        - #KE\_810\_073 Z:SAEULE B,M,SCHWELL
          - #KE\_809\_223 G:SAEULE B,INNEN
            - #KE\_809\_071 G:VERSTAERKUNG SAEULE B
            - #KE\_810\_199 G:SCHLIESSTEIL SAEULE B
            - #KE\_810\_121 G:SCHLIESSTEIL SAEULE B

Bibliotheken

Runs (PV:162)

Name

- CAD Varianten
  - AU513\_1xx\_BK\_FF\_EU\_L\_VD\_-\_K5B-\_-L0L-3FA\_-\_0162
  - AU516\_1xx\_BK\_FF\_CN\_L\_VD\_-\_K4H-5C3-L0L-3FA\_-\_0162**
  - AU516\_1xx\_BK\_FF\_EU\_L\_VD\_-\_K4H-\_-L0L-3FA\_-\_0162

**product variants**

**product structure from CATIA**

Short description

Name	Short description	Material	MaterialID	Nummer	Wandstärke
AU513	AU513/6	K4H	5C3		
CAD	#KE_810_553_PCA_TM_015_VERSTAERKUNG	K4H		CR240LA-GI40/40-U	#KE_810_553_ 1,8mm
CAD	#KE_809_655_B_PCA_TM_002_ET_SCHARNIER	K4H		CR4-GI40/40-U	#KE_809_655_B_ 1,2mm
CAD	#KE_806_207_PCA_TM_002_VERST_SCHARNIERAUF	K4H		CR330Y590T-DP-GI40/40-U	#KE_806_207_ 1,5mm
CAD	#KE_809_745_PCA_TM_022_VERST_SAEULE_C_OBE	K4H		CR300LA-GI40/40-U	#KE_809_745_ 0,9mm
CAD	#KE_809_263_G01_TM_018_VERST_SAEULE_C_UNT	K4H, K5B		CR300LA-GI40/40-U	#KE_809_263_ 0,9mm
CAD	#KE_809_697_DMJ_TM_006_SCHOTTT_SA_C_UN_SIKA	K4H		PE-Copolimerisat	#KE_809_697_ 1,5mm
CAD	#KE_810_391_A_G01_TM_001_VERL_SAEULE_A_AUSS	K4H		CR330Y590T-DP-GI40/40-U	#KE_810_391_A_ 1,5mm
CAD	#KE_810_889_DMJ_TM_004_SCHOTTT_SAEUL_D_IN_SIKA	K4H		CR4-GI40/40-U	#KE_809_847_ 1,5mm
CAD	#KE_809_647_DMJ_TM_008_SCHOTTT_SAEUL_C_MIT_SIKA	K4H		CR4-GI40/40-U	#KE_809_307_ 0,7mm
CAD	#KE_809_697_A_DMJ_TM_005_SCHOTTT_SA_C_UN_AU_SIKA	K4H		CR240LA-GI40/40-U	#KE_806_095_ 1,1mm
CAD	#KE_809_307_G01_TM_020_VERST_SAEULE_D	K4H, K5B		CR240LA-GI40/40-U	#KE_805_523_ 1,2mm
CAD	#KE_806_095_PCA_TM_014_SCHOTTT_SAEULE_BFG	K4H, K5B		PE-Copolimerisat	#KE_809_571_ 1,5mm
CAD	#KE_809_329_PCA_TM_014_SAEULE_D_INNEN_UNT	K4H, K5B		CR240LA-GI40/40-U	#KE_809_285_ 1,4mm
CAD	#KE_810_555_PCA_TM_009_VERST_DACHREILING	K4H, K5B		HX340LAD+2100MBO	8W0_809_625_A_ 2,5mm
CAD	#KE_810_283_G01_TM_023_SAEULE_A_AUSS_OBEN	K4H, K5B		CR330Y590T-DP-GI40/40-U	#KE_809_297_ 2,5mm
CAD	#KE_809_111_PCA_TM_020_VERSTEIFUNGSTE_KFB	K4H, K5B		CR440Y590T-DP-SC42747	#KE_810_313_ 0,9mm
CAD	#KE_805_523_PCA_TM_014_SCHOTTT_SAEUL_U_AU_SIKA	K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_809_382_ 2,1mm
CAD	#KE_809_571_DMJ_TM_003_SCHOTTT_SAEUL_U_AU_SIKA	K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_809_067_ 2mm
CAD	#KE_809_285_G01_TM_009_VERST_SAEULE_A_MI	K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_809_755_ 1,4mm
CAD	8W0_809_625_A_G01_TM_007_033_SCHARNIERVERST	K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_810_269_ 1,5mm
CAD	#KE_810_215_G01_TM_014_SCHARNIERVERSTAERK	K4H, K5B			
CAD	#KE_809_297_PCA_TM_020_SCHARNIERVERST_S	K4H, K5B			
CAD	#KE_810_313_PCA_TM_017_STEGTEIL_SAEULE_C	K4H, K5B			
CAD	#KE_809_695_PCA_TM_013_VERST_SCHWELLER_2	K4H, K5B			
CAD	#KE_809_393_PCA_TM_015_VERST_SCHWELLER_3	K4H, K5B			
CAD	#KE_809_067_PCA_TM_009_VERST_SCHWELLER_VO	K4H, K5B			
CAD	#KE_809_755_G01_TM_016_SCHWELLER_AUSSEN	K4H, K5B			
CAD	#KE_810_269_G01_TM_016_STEGT_SCHWELLER_VO	K4H, K5B			
CAD	#KE_809_739_G01_TM_021_VERSTAERKUNG_INNEN	K4H, K5B			
CAD	#KE_809_801_DMJ_TM_005_SCHOTTT_SCHWELL_MI_SIKA	K4H, K5B			

**CAD parts**

**CAD meta data**

Material	MaterialID	Nummer	Wandstärke
K4H	5C3		
K4H		CR240LA-GI40/40-U	#KE_810_553_ 1,8mm
K4H		CR4-GI40/40-U	#KE_809_655_B_ 1,2mm
K4H		CR330Y590T-DP-GI40/40-U	#KE_806_207_ 1,5mm
K4H		CR300LA-GI40/40-U	#KE_809_745_ 0,9mm
K4H, K5B		CR300LA-GI40/40-U	#KE_809_263_ 0,9mm
K4H		PE-Copolimerisat	#KE_809_697_ 1,5mm
K4H		CR330Y590T-DP-GI40/40-U	#KE_810_391_A_ 1,5mm
K4H		CR4-GI40/40-U	#KE_809_847_ 1,5mm
K4H		CR4-GI40/40-U	#KE_809_307_ 0,7mm
K4H		CR240LA-GI40/40-U	#KE_806_095_ 1,1mm
K4H, K5B		CR240LA-GI40/40-U	#KE_805_523_ 1,2mm
K4H, K5B		PE-Copolimerisat	#KE_809_571_ 1,5mm
K4H, K5B		CR240LA-GI40/40-U	#KE_809_285_ 1,4mm
K4H, K5B		HX340LAD+2100MBO	8W0_809_625_A_ 2,5mm
K4H, K5B		CR330Y590T-DP-GI40/40-U	#KE_809_297_ 2,5mm
K4H, K5B		CR440Y590T-DP-SC42747	#KE_810_313_ 0,9mm
K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_809_382_ 2,1mm
K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_809_067_ 2mm
K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_809_755_ 1,4mm
K4H, K5B		CR700Y980T-DP-GI40/40-U	#KE_810_269_ 1,5mm

- Same product structure as in PDM & CATIA
- Direct access to important meta data (material, thickness,...)
- Full version control (parts, groups, product,...)
- LiveMode for interactive collaboration
- Handling of product variants

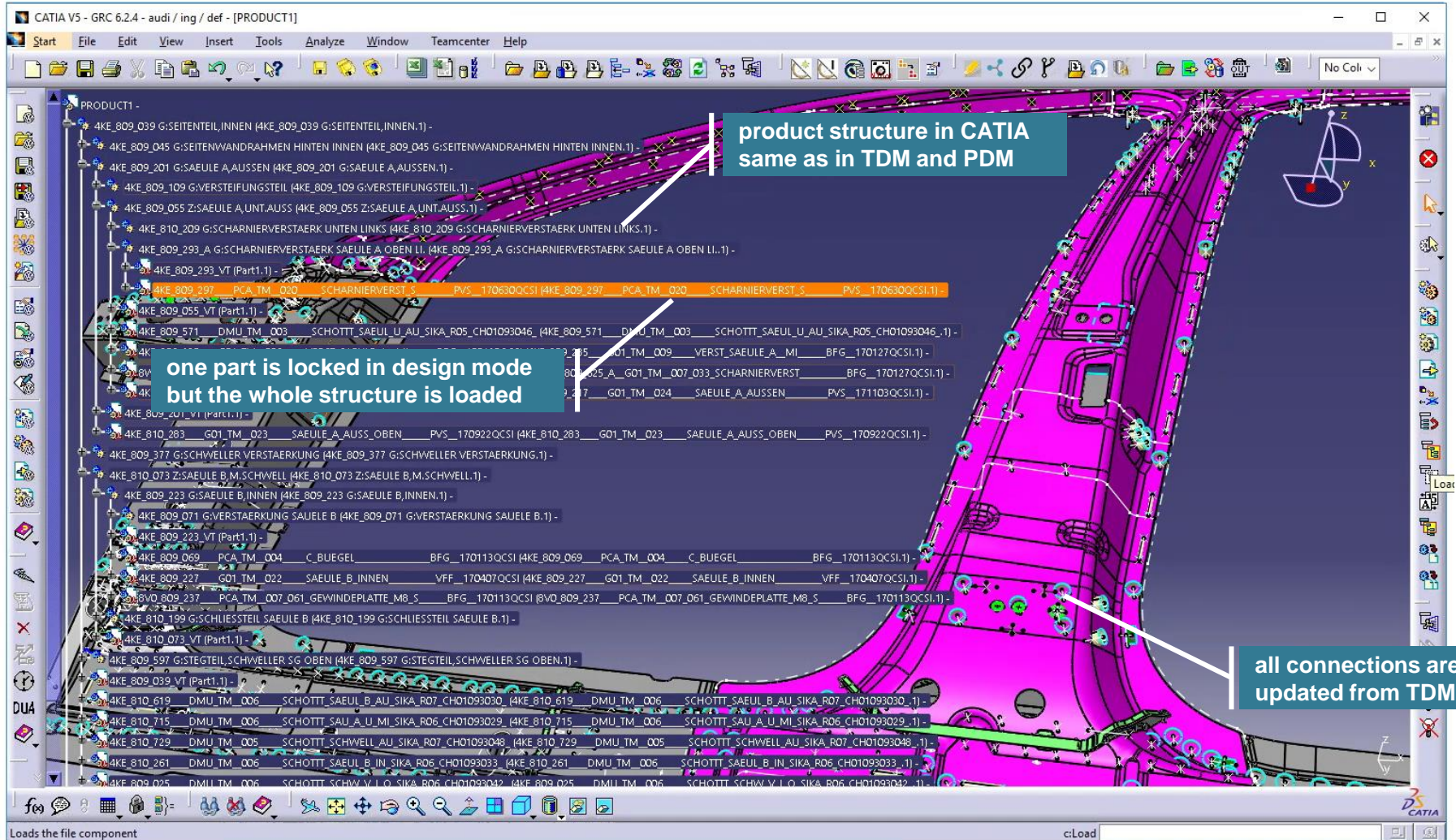
**"LiveMode" with interactive locking for instant collaboration**



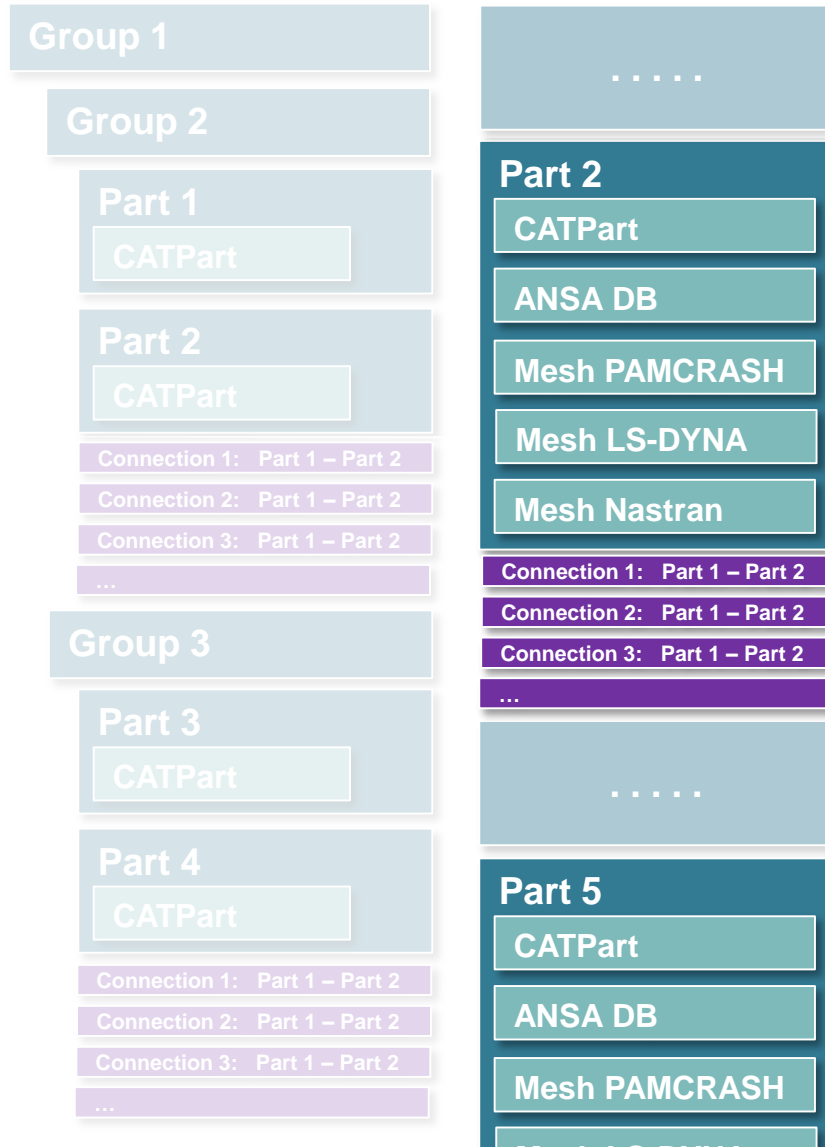


## CATIA V5\*

\*the CATIA V5 integration for the "Body18" has been implemented by csi Entwicklungstechnik GmbH







## Challenges

- Handling of geometry for meshing
- Handling of meshes for working with the simulation models
- Connections created on the fly in ANSA from TDM system
- The whole product can be opened at once
- Changes are saved to each part and connection individually
- ...



# Implementation - ANSA

CAD

Mesh

CAE

Result

## TDM System

product structure from CATIA

Name	Short description	File Type	Discipline	Material ID	Number	Wandstärke	
4KE_809_039 G:SEITENTEIL.INNEN							
4KE_809_045 G:SEITENWANDRAHMEN HINTEN INNEN							
4KE_809_051 G:SEITENTEIL HINTEN INNEN							
4KE_806_241_B G:AUFNAHME SCHARNIER							
4KE_809_453 G:EINSATZTEIL							
4KE_810_417 G:VERSTAERKUNG DACHREILING							
AU516_1	AU513/6		MESH				
4KE_809_297_... (2 components)							
4KE_809_055 Z:SAEULE A,UNT.AUSS		CAD	CAD	CR330Y590T-DP-GI40/40-U	4KE_809_297_...	2.	
4KE_809_293_A G:SCHARNIERVERSTAERK SAEULE A OBEN		CAD	ansa	MESH	CR330Y590T-DP-GI40/40-U	4KE_809_297_...	2.
4KE_809_377 G:SCHWELLER VERSTAERKUNG		VT					
4KE_809_597 G:STEGTEIL,SCHWELLER SG OBEN		VT					
4KE_810_073 Z:SAEULE B,M.SCHWELL		VT					
Assemblies for different solvers							
CAE Zusammenbau LS-DYNA							
AU513_1xx_BK_PF_EU_L_VD_-_K5B-L0L-3FA_-_0107		VT					
AU516_1xx_BK_PF_CN_L_VD_-_K4H-L0L-3FA_-_0107		VT					
AU516_1xx_BK_PF_EU_L_VD_-_K4H-L0L-3FA_-_0107		VT					
CAE Zusammenbau NASTRAN							
CAE Zusammenbau PAM-CRASH							
4KE_809_293_...0800		VT					

Container for all data related to one part

Geometry as CATPart

Mesh as ANSA DB

Assemblies for different solvers

ANSA v18.1.0 64-bit (/tmp/tmpaOuMhz/4KE\_809\_297\_...PCA\_TM\_...020\_...SCHARNIERVERST\_...)

File Tools Utilities Lists Assembly Plugins Windows Help

Hot Points: Insert, Project, Parametric, Delete, Mult.Proje., Intersect, Release, Weld Spot

CONTS: Paste, Release, Fill Hole, Open Hole, Project, Break

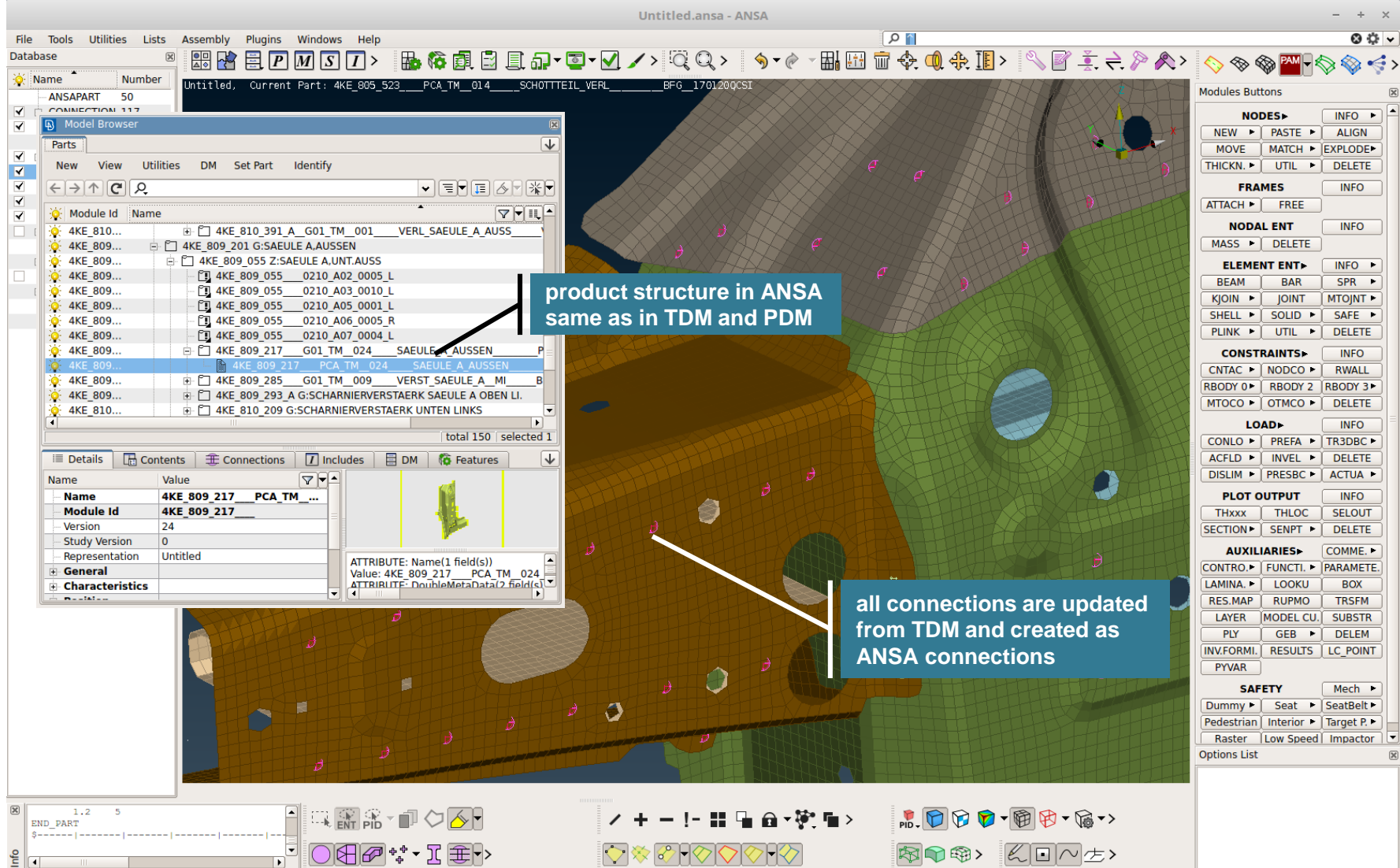
Faces: Cut, Delete, Undelete, New, Set PID, Topo, Proj.Cut, Mid.Surf., Rm.Log., Fuse, Flange, Rm.Dbl, Plane Cu., Offset, Freeze/Un, Zone Cut, Convert, Dach, Intersect, Extend, Orient, Modify

Surfaces: Info

Options List

- Geometry and Mesh are stored together
- Whole product or groups can be opened
- Comparing of mesh and geometry
- Assemblies can create includes for multiple solvers

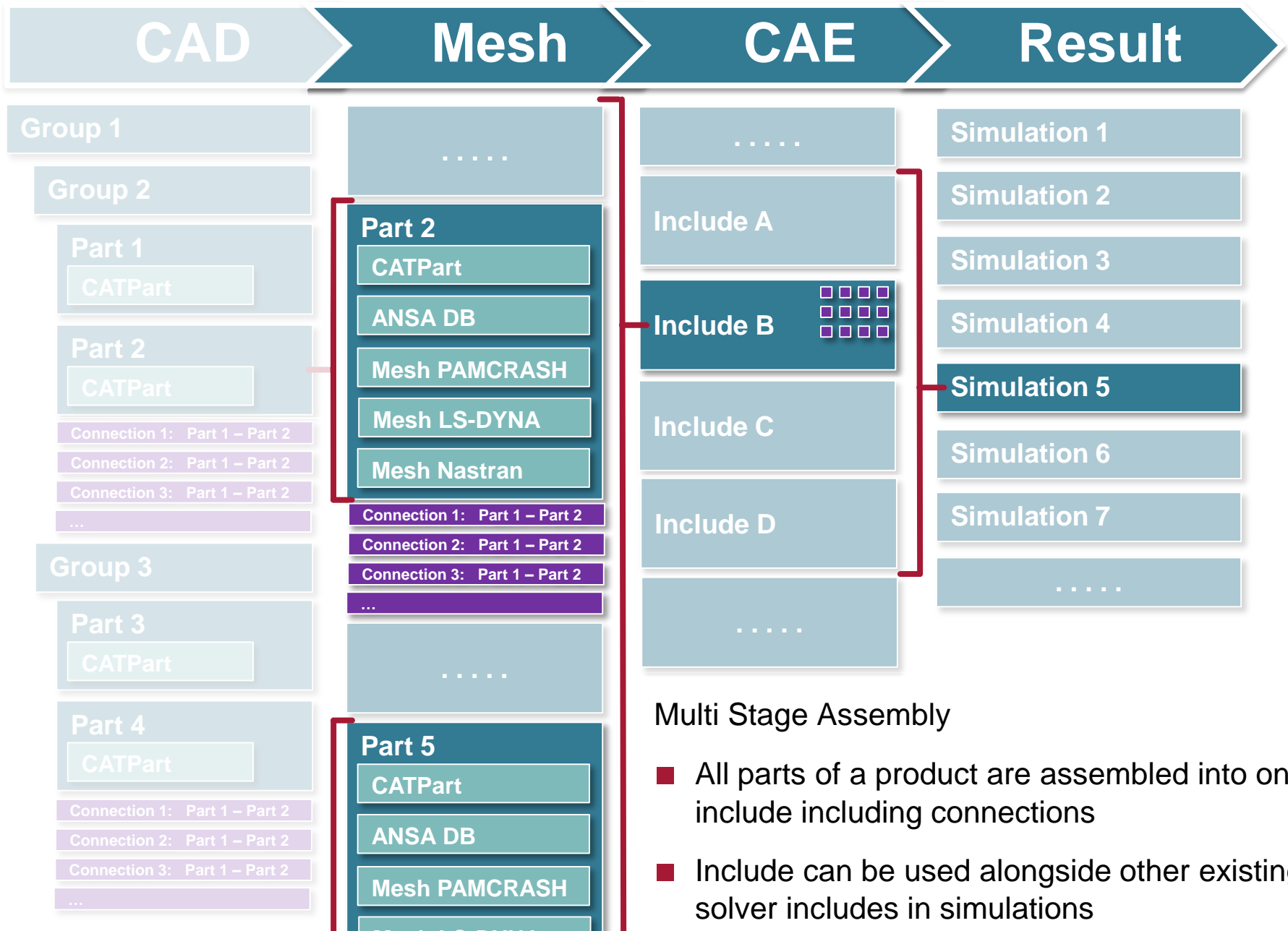
## ANSA



product structure in ANSA same as in TDM and PDM

all connections are updated from TDM and created as ANSA connections

# Implementation - *closing the gap to CAE*





# Implementation - closing the gap to CAE

The result of the assembled CAD data (*RunOutputComponent*) is used as a solver include in simulations.

The solver include is directly linked to the CAD assembly and gets updated if CAD data changes.

CAD body in white pool mounted in simulation pool

## CAE

**Components (PV:57)**

Name	Short description	Count
(4 values)		
AU516_1xx_B_PF_C	IIHS	7
Material	2016_connection_pc2015	2
Material	2016_misc	2
Material	2016_car_component	1
Material	2016_connection_d	1
Leichtmetalle	2016_light_metal	4
Leichtmetalle	2016_light_metal	1
Karosserie	Bild_Uebersicht	10
Karosserie	AU516_EU_OutOf	6
Karosserie	AU516_EU	2
Header	Projekt	1
Header	Pyvar_Def	2
Header	CB_01_CarImpact_Input_Pamcrash	9
Header	CB_05_ALL_Ende_Pamcrash	4
Header	CB_02_ALL_Solving_Pamcrash	6
Header		
Gummi		
Globale Defini		
Globale Defini	Masse	11
Globale Defini	OUTextract	9

**Runs (PV:57)**

Name
Strukturcrash
PAM-Crash
AU516
AU516_1xx_B_PF_C_US_sii_551_0057_Lqq_SR
AU516_1xx_B_PF_C_US_spfe_32_0057_Lqq_SR
LS-DYNA
NVH
Nastran

## CAD

**Assembly Structure:**

- 4KE\_809\_201 G:SAEULE A,AUSSEN
- 4KE\_809\_055 Z:SAEULE A,UNT.AUSS
- 4KE\_809\_293\_A G:SCHARNIERVERSTAERK SAEULE A OBEN
- 4KE\_810\_209 G:SCHARNIERVERSTAERK UNTEN LINKS
- 4KE\_809\_109 G:VERSTEIFUNGSTEIL
- 4KE\_809\_377 G:SCHWELLER VERSTAERKUNG
- 4KE\_809\_597 G:STEGTEIL,SCHWELLER SG OBEN
- 4KE\_810\_073 Z:SAEULE B,M.SCHWELL

**Runs (PV:107)**

Name
CAE Zusammenbau LS-DYNA
AU513_1xx_BK_PF_EU_L_VD_-K5B-L0L-3FA_-0107
AU516_1xx_BK_PF_CN_L_VD_-K4H-L0L-3FA_-0107
AU516_1xx_BK_PF_EU_L_VD_-K4H-L0L-3FA_-0107
CAE Zusammenbau NASTRAN
CAE Zusammenbau PAM-CRASH

Includes for different product variants are created from the same data

working on the simulation model

Assemblies for different solvers create as result solver include files. ANSA is used in batch to create the includes and connections are realized according to the needs of the simulation.

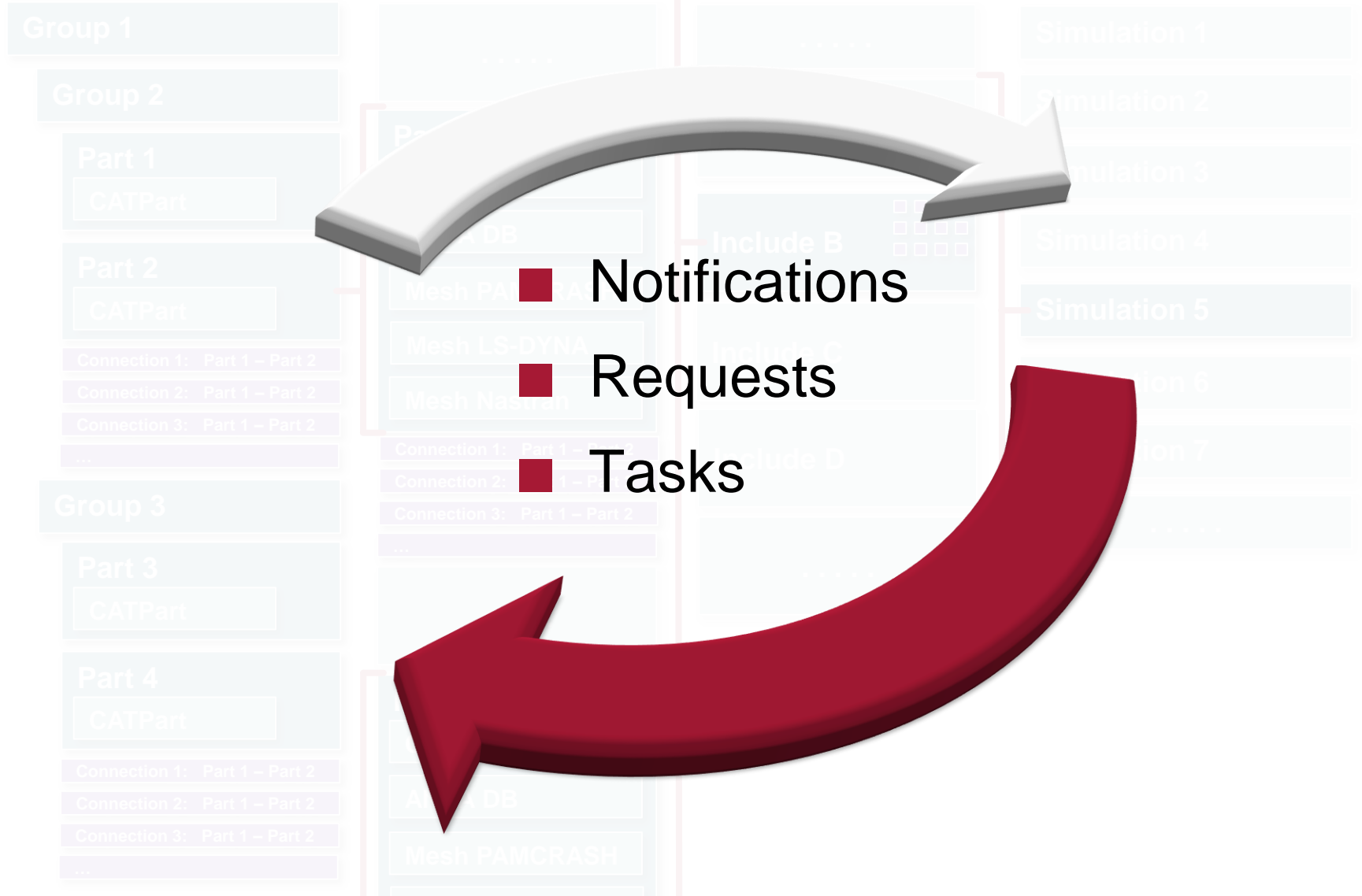
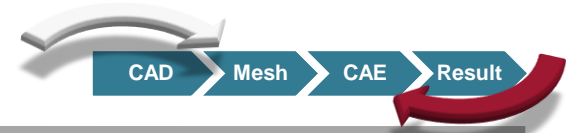
## ANSA

ANSA simulation model showing a detailed view of the car body structure with various components highlighted in different colors (yellow, green, red).

Simulations for different product variants, solvers and disciplines can be set up based on the same CAD and MESH data.

Working with simulation models in ANSA occurs on same meshes and CAD data

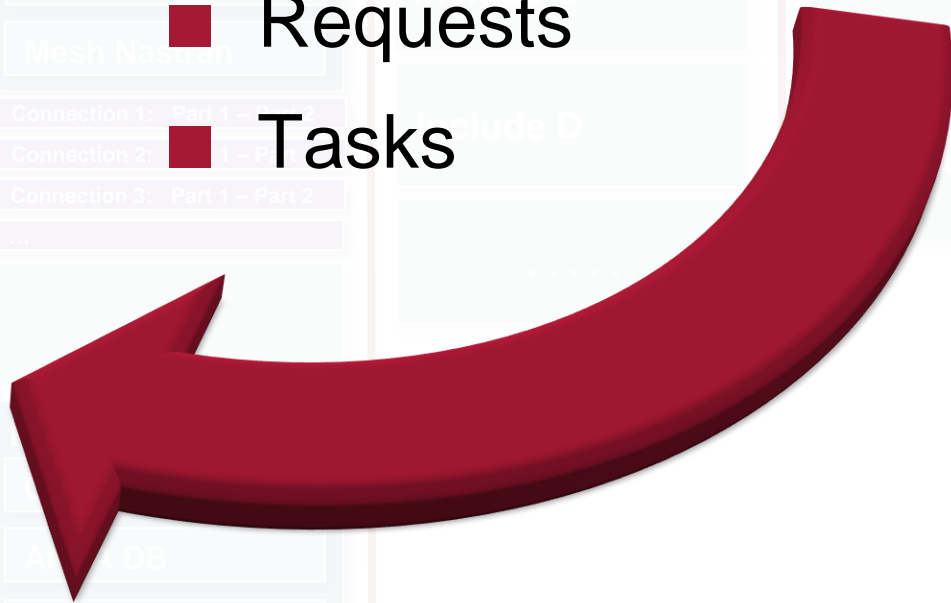
# Implementation - *project management*



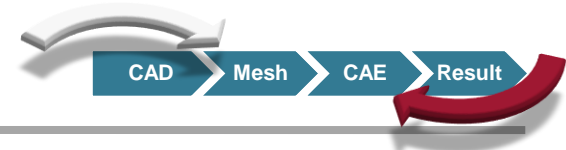
■ Notifications

■ Requests

■ Tasks



# Implementation - *project management*



Tasks are created directly with the desktop clients

Kanban-Board for easy task management



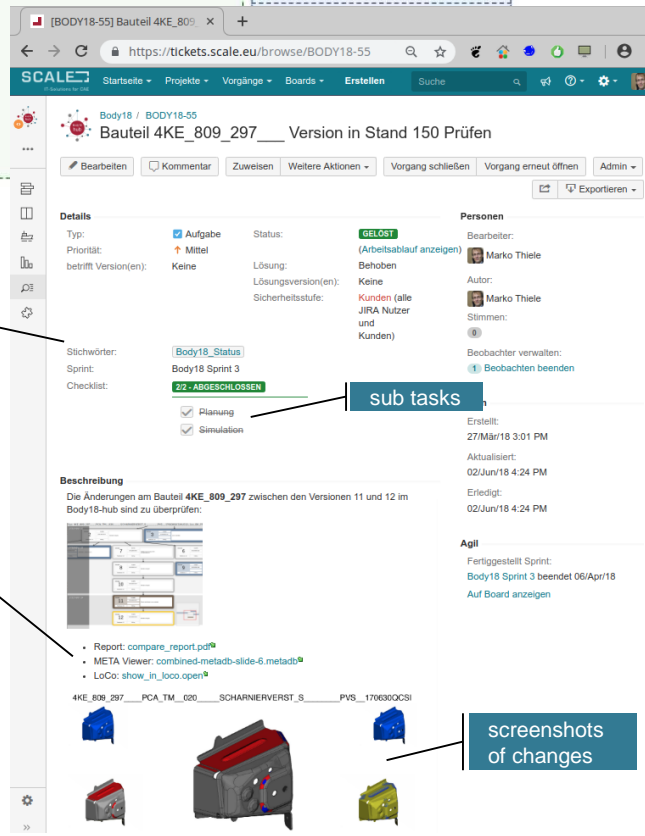
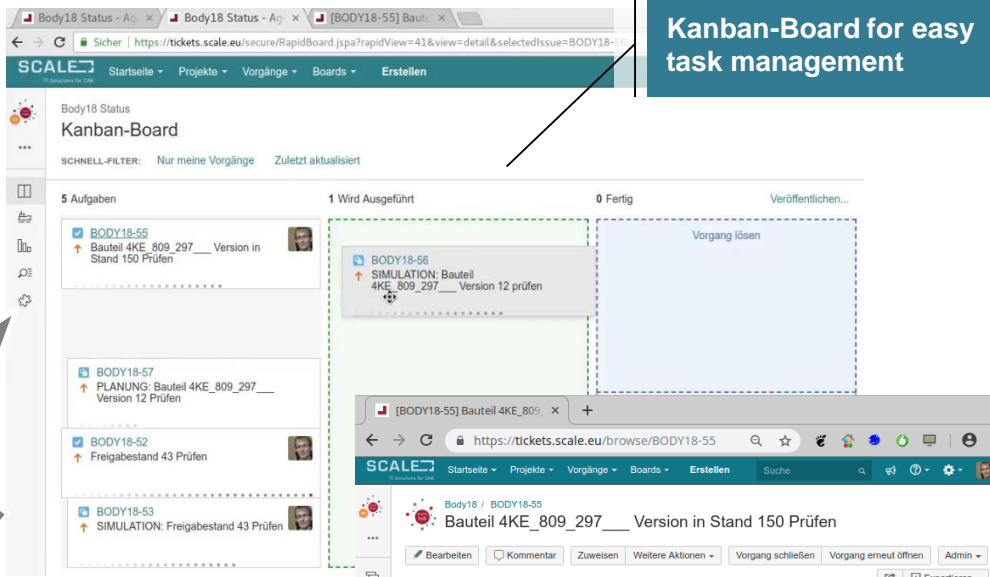
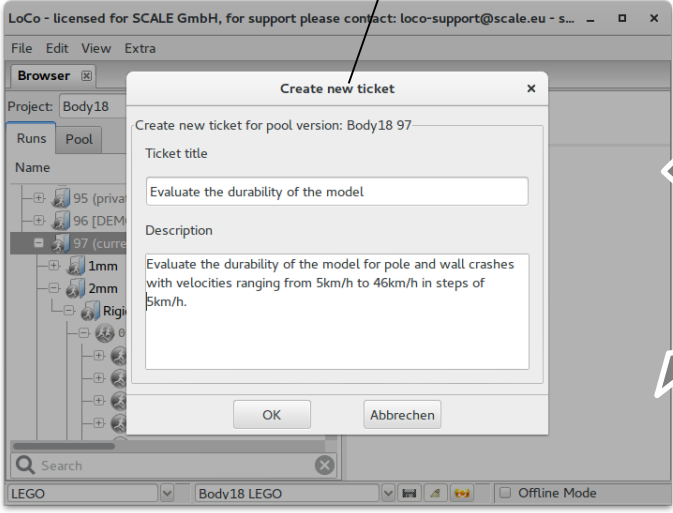
Integration with project management system

detailed task description with automatically created content

sub tasks

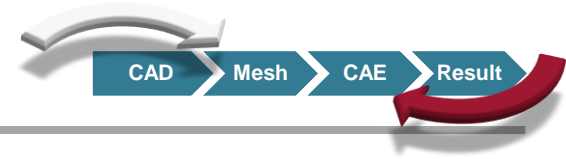
links to related documents

screenshots of changes



- Integration of in house project management system
- Full capabilities of commercial project management systems
- Tasks are directly linked to CAD/CAE data
- All communication related to a task is documented





- Simultaneous working with CAD data in CATIA
- Geometry and meshes handled as one object (*part*)
- Seamless transition between CAD and CAE
- Using the same Geometry and Meshes for
  - Multiple product variants
  - Simulating with different solvers
  - Load cases in different disciplines
- Integration of project management tools

# Outlook – upcoming GUI for designers in CAx-Hub

**Pool (Projekt)**

**Version (PoolVersion)**

**Variante (RunConfig)**

**Schweißgruppen**

**Geometrie**

**Verbindungstechnik**

**Drag'n'Drop**

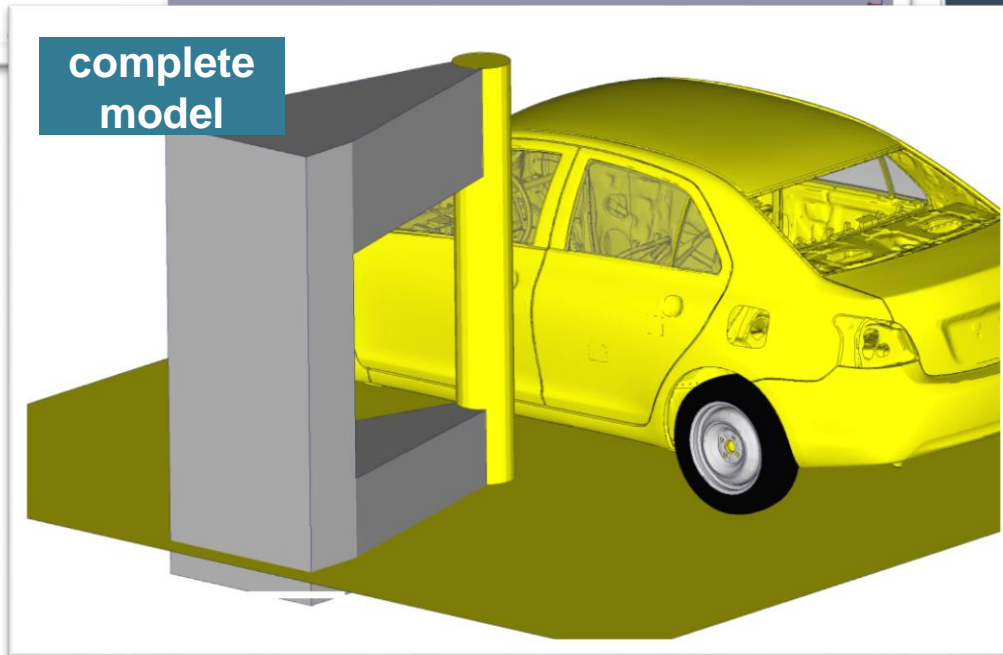
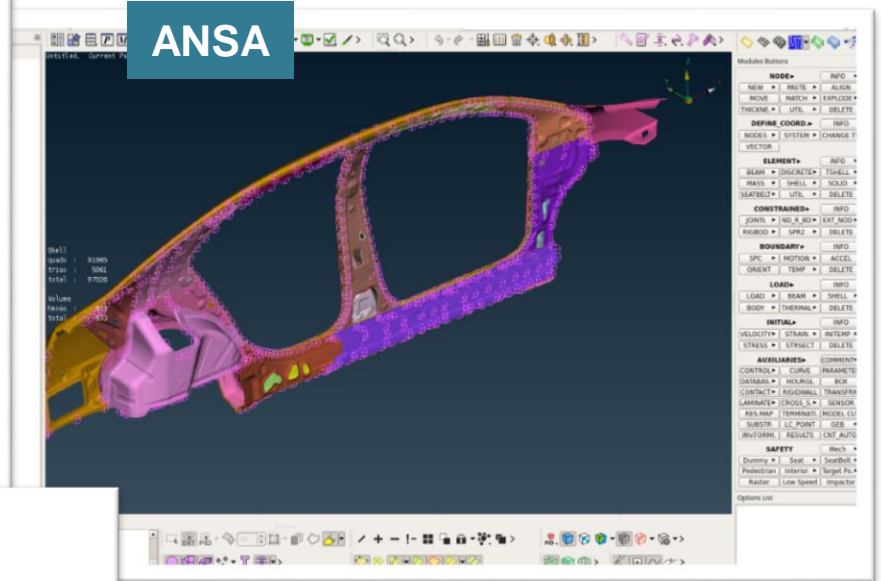
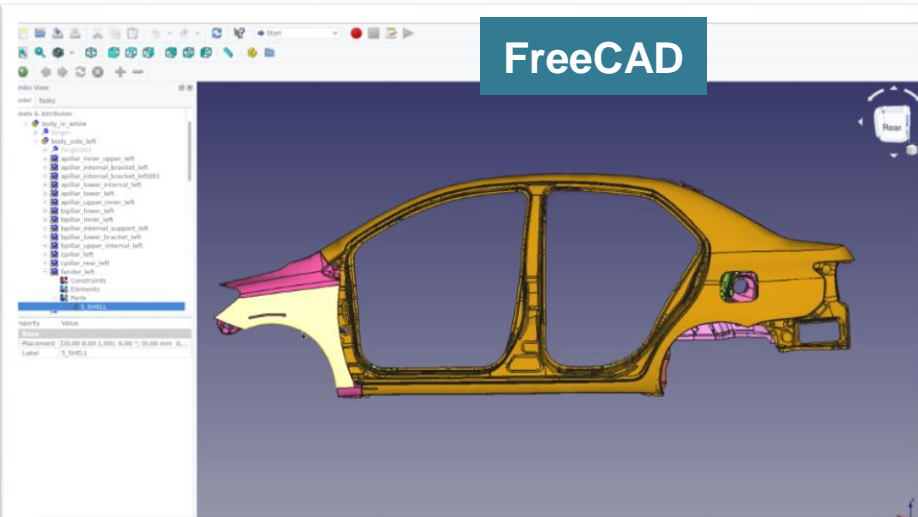
**Hier Attribute und Metadaten z.B. Wandstärke, Material, Steuerung, ...**

Name	Version	Metadata	Attributes
4KE_809_039 G:SEITENTEIL,INNEN	75		
4KE_809_045 G:SEITENWANDRAHMEN HINTEN INNEN	47		
4KE_809_201 G:SAEULE A,AUSSEN	53		
4KE_809_055 Z:SAEULE A,UNT.AUSS	47		
4KE_809_293_A G:SCHARNIERVERSTAERK SAEULE A OBEN LI.	37		
4KE_810_209 G:SCHARNIERVERSTAERK UNTEN LINKS	28		
4KE_809_109 G:VERSTEIFUNGSTEIL	35		
4KE_809_377 G:SCHWELLER VERSTAERKUNG	29		
4KE_809_739__G01_TM_021__VERSTAERKUNG_INNEN	9		
4KE_809_067__PCA_TM_009__VERST_SCHWELLER_VORNE	11		
4KE_810_269__G01_TM_016__STEGT_SCHWELLER_VORNE	30		
4KE_809_377__0210_A13_0005_L	31		
4KE_809_377__0210_A14_0053_L	25		
4KE_810_199 G:SCHLIESSTEIL SAEULE B	25		
4KE_810_121 G:SCHLIESSTEIL SAEULE B	24		
Bibliotheken	25		

**History**

- 19 Attributes changed.
- 18 Attributes changed.
- 17 import test results...
- 16 Attributes changed.
- 15 added test sensor...
- 14 test\_with\_sensors
- 13 Short description ...
- 12 test
- 11 Change SWP to sol...
- 9 Attributes changed.
- 8 deleted space in b...
- 7 Academic Model: ...
- 6 Kommentarzeilen ...
- 5 Short description ...
- 4 Attributes changed.
- 3 Short description ...
- 2 master set for spo...
- 1 neuer Stand; Upd...

# Outlook – public DEMO setup using FreeCAD and ANSA



- CAD model in FreeCAD (free and open-source CAD software)
- Mesh generated by ANSA from CAD data
- Shared Connection definitions
- FE model for different solvers and disciplines (including LS-DYNA for NVH and Crash)

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

