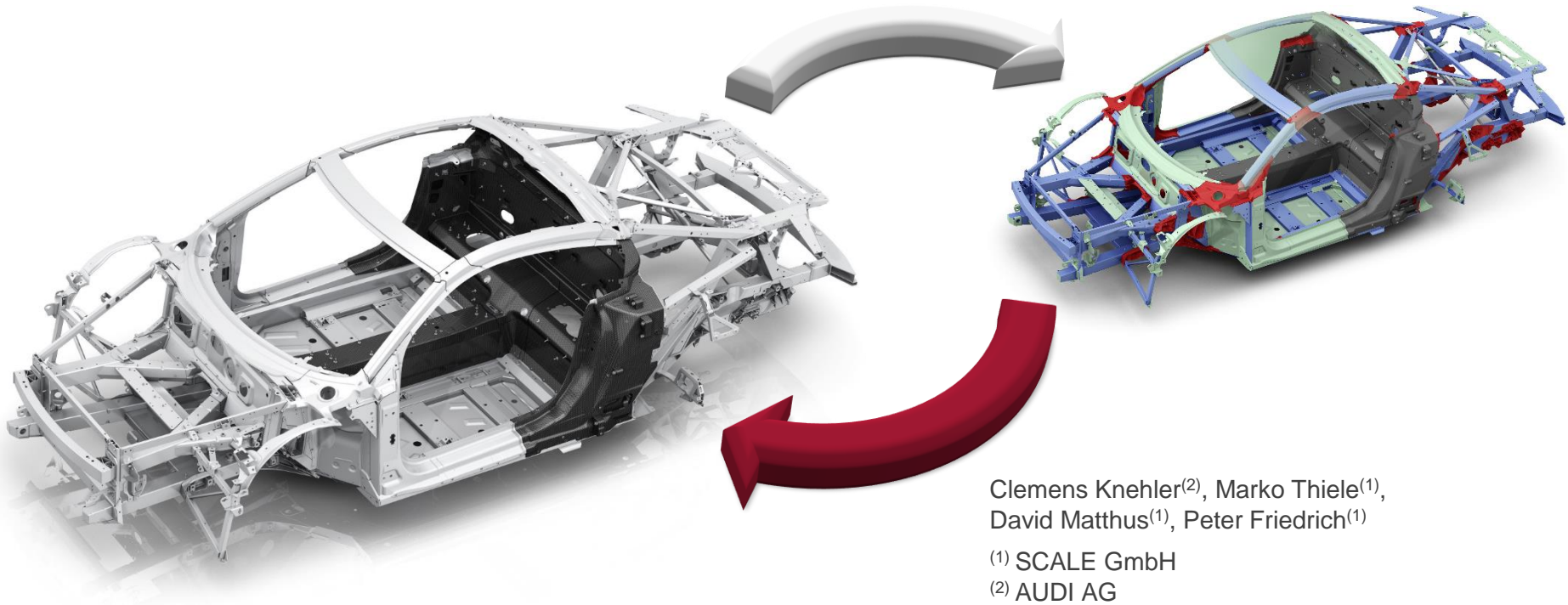


# Prospects of integrating CAD and CAE in Simulation Data Management



Clemens Knebler<sup>(2)</sup>, Marko Thiele<sup>(1)</sup>,  
David Matthus<sup>(1)</sup>, Peter Friedrich<sup>(1)</sup>

<sup>(1)</sup> SCALE GmbH

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

# 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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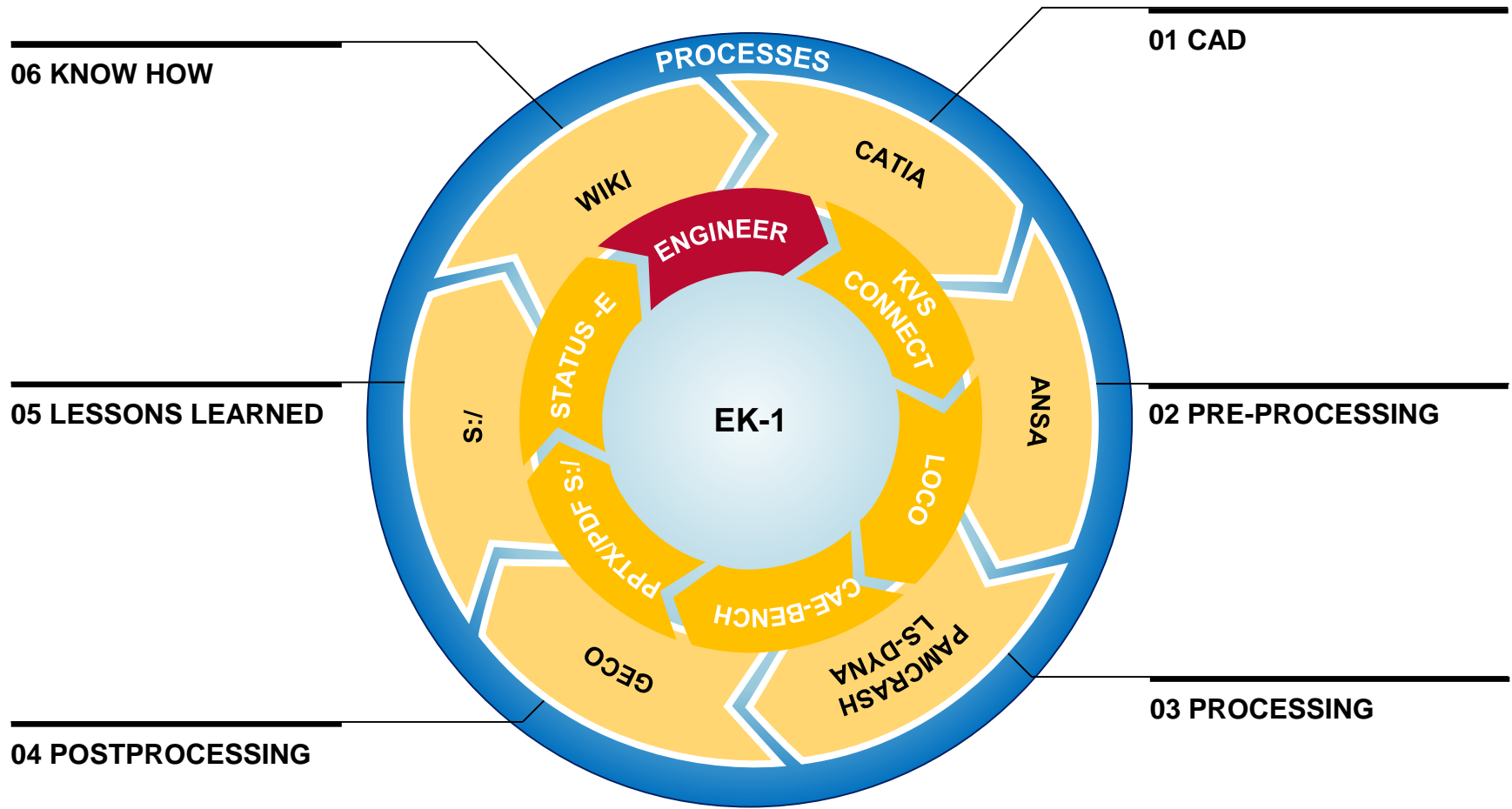


- Roundup
- Outlook

# Integrating CAD and CAE - *motivation for Body18*

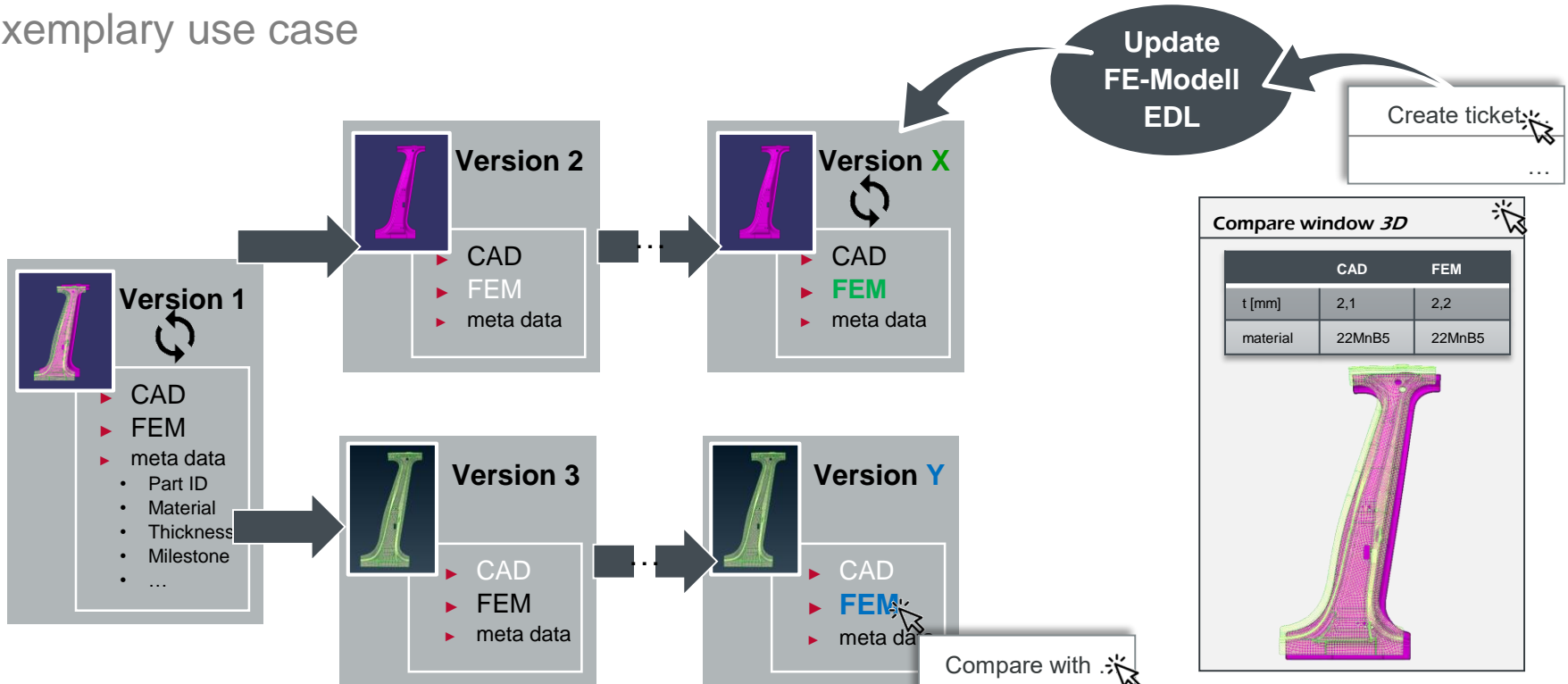


TOOL GENERATE DATA  
TOOL STORE DATA



# 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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  - Data structure
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- Implementation of Body18 “Proof of Concept”
  - Integration of CATIA for CAD and ANSA for CAE
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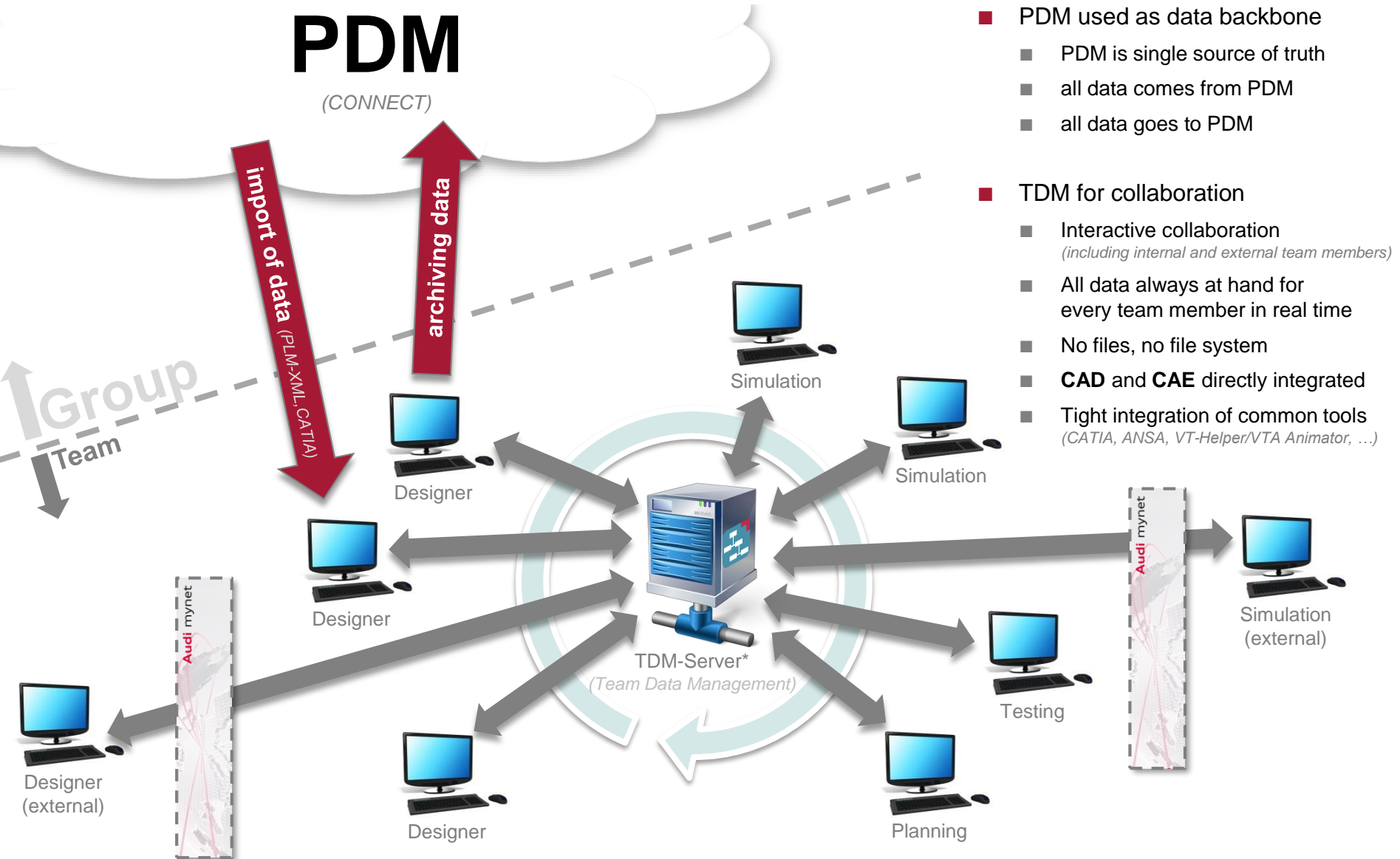


# Body18 "Proof of Concept" at AUDI - setup



## PDM

(CONNECT)



- PDM used as data backbone
  - PDM is single source of truth
  - all data comes from PDM
  - all data goes 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”

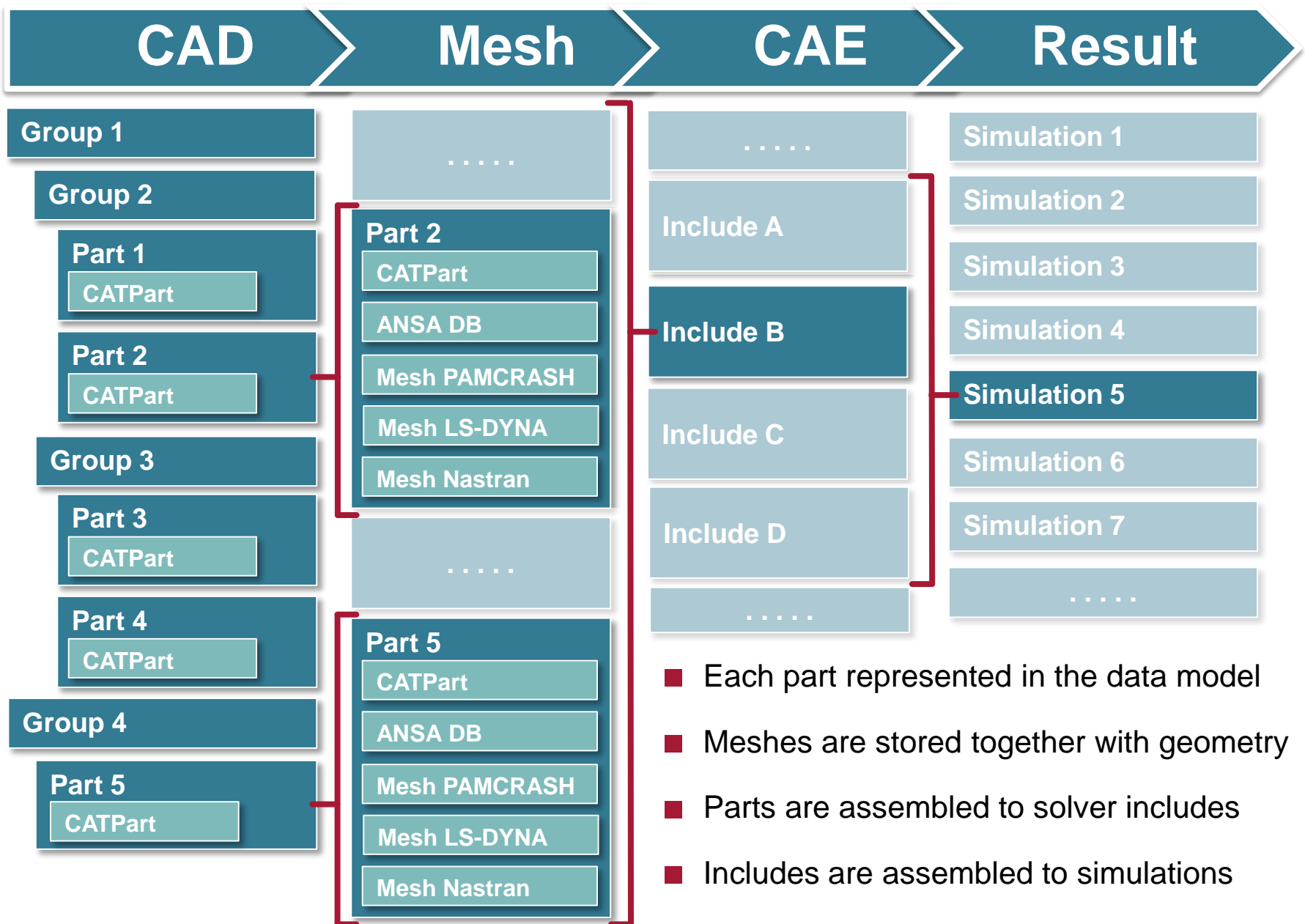
- Integration of CATIA for CAD and ANSA for CAE
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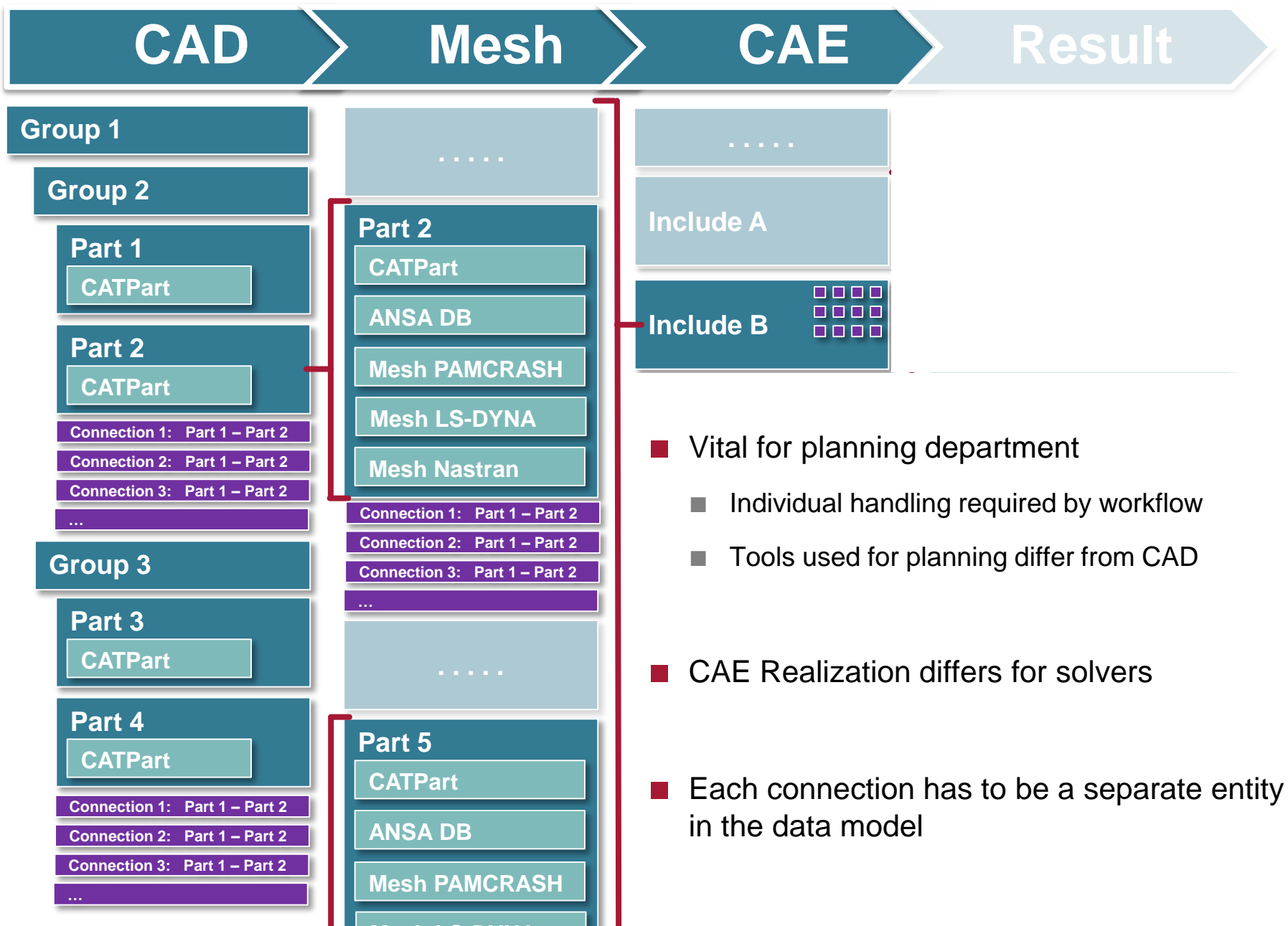
- Roundup
- Outlook



# 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
- .....

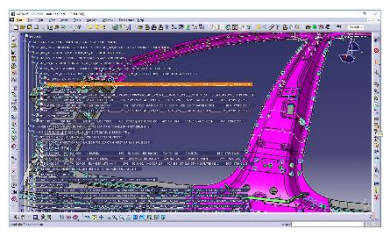
# Implementation - CATIA

Body18

product structure from CATIA

Name	Short description	PR-Familie_KAR	PR-Familie_KSA	File Type	MaterialID	Nummer
AUTS_AUS13/6		K41	SC3	CATPart		
CAD_#KE_810_553_PCA_TM_015	VERSTAERKUNG_DACHR_VFF_170519QCSI	K41		CATPart		KE_810_553
CAD_#KE_809_655_B_PCA_TM_002	ET_SCHARNIERAU_HRL_NS_180119QCSI	K41		CATPart		KE_809_655_B
CAD_#KE_806_207_PCA_TM_002	VERST_SCHARNIERAUFP_NS_180119QCSI	K41		CATPart		KE_806_207
CAD_#KE_809_745_PCA_TM_022	VERST_SAEULE_C_OBE_VFF_170419QCSI	K41		CATPart	CR300L4G140/40-U	KE_809_745
CAD_#KE_809_263_G01_TM_018	VERST_SAEULE_C_UNT_VFF_170407QCSI	K41, K5B		CATPart	CR300L4-G140/40-U	KE_809_263
CAD_#KE_809_697_DMU_TM_006	SCHOTT_SA_C_LIN_BI_SKA_R08_CH01093037	K41		CATPart	PE-Copolymerisat	KE_809_697
CAD_#KE_810_391_A_G01_TM_001	VERL_SAEULE_A_AUSS_VFF_170413QCSI	K41		CATPart	CR3301590T-DP-G140/40-U	KE_810_391_A
CAD_#KE_810_889_DMU_TM_004	SCHOTT_SAEUL_D_M_SKA_R05_CH01093043	K41		CATPart	PE-Copolymerisat	KE_810_889
CAD_#KE_809_647_DMU_TM_008	SCHOTT_SAEUL_C_MIT_SKA_R06_CH01093036	K41		CATPart	PE-Copolymerisat	KE_809_647
CAD_#KE_809_697_A_DMU_TM_005	SCHOTT_SA_C_LIN_AU_SKA_R06_CH01093038	K41		CATPart	PE-Copolymerisat	KE_809_697_A
CAD_#KE_809_307_G01_TM_020	VERST_SAEULE_D_VFF_170505QCSI	K41		CATPart	CR4-G140/40-U	KE_809_307
CAD_#KE_806_095_PCA_TM_014	SCHOTTTEIL_SAEULE_BFG_170120QCSI	K41		CATPart	CR240LA-G140/40-U	KE_806_095
CAD_#KE_809_329_PCA_TM_014	SAEULE_D_INNEN_LINT_VFF_170519QCSI	K41		CATPart	CR4-G140/40-U	KE_809_329
CAD_#KE_810_555_PCA_TM_009	VERST_DACHREILING_VFF_170428QCSI	K41		CATPart	CR240LA-G140/40-U	KE_810_555
CAD_#KE_810_283_G01_TM_023	SAEULE_A_AUSS_OBEH_PVS_170922QCSI	K41		CATPart	2294-ES-A560/60	KE_810_283
CAD_#KE_809_111_PCA_TM_020	VERSTEUERUNGSTEIL_KFB_BFG_170120QCSI	K41, K5B		CATPart	CR240LA-G140/40-U	KE_809_111
CAD_#KE_805_523_PCA_TM_014	SCHOTTTEIL_VERL_BFG_170120QCSI	K41, K5B		CATPart	CR240LA-G140/40-U	KE_805_523
CAD_#KE_809_571_DMU_TM_003	SCHOTT_SAEUL_U_AU_SKA_R05_CH01093046	K41, K5B		CATPart	PE-Copolymerisat	KE_809_571
CAD_#KE_809_285_G01_TM_009	VERST_SAEULE_A_MI_BFG_170120QCSI	K41, K5B		CATPart	CR240LA-G140/40-U	KE_809_285
CAD_#KE_809_625_A_G01_TM_007_033	SCHARNIERVERST_BFG_170127QCSI	K41, K5B		CATPart	HX340LAD-z100M80	8W0_809_625_A
CAD_#KE_810_215_G01_TM_014	SCHARNIERVERSTAERK_PVS_170714QCSI	K41, K5B		CATPart	CR380LA-G140/40-U	KE_810_215
CAD_#KE_809_297_PCA_TM_020	SCHARNIERVERST_S_PVS_170630QCSI	K41, K5B		CATPart	CR3301590T-DP-G140/40-U	KE_809_297
CAD_#KE_810_313_PCA_TM_017	STEGTEIL_SAEULE_C_VFF_170526QCSI	K41, K5B		CATPart	CR440780T-DP-EG47/47	KE_810_313
CAD_#KE_809_695_PCA_TM_013	VERST_SCHWELER_2_VFF_170526QCSI	K41, K5B		CATPart	CR3301590T-DP-EG47/47	KE_809_695
CAD_#KE_809_393_PCA_TM_015	VERST_SCHWELER_3_VFF_170526QCSI	K41, K5B		CATPart	CR3301590T-DP-EG47/47	KE_809
CAD_#KE_809_067_PCA_TM_009	VERST_SCHWELER_VO_VFF_170303QCSI	K41, K5B		CATPart	CR3301590T-DP-G140/40-U	KE_809
CAD_#KE_809_755_G01_TM_016	SCHWELER_AUSSEN_VFF_170602QCSI	K41, K5B		CATPart	CR7001980T-DP-G140/40-U	KE_809
CAD_#KE_810_269_G01_TM_016	STEG_SCHWELER_VO_PVS_170602QCSI	K41, K5B		CATPart	CR7001980T-DP-G140/40-U	KE_810
CAD_#KE_809_739_G01_TM_021	VERSTAERKUNG_INNEN_VFF_170602QCSI	K41, K5B		CATPart	CR7001980T-DP-EG47/47	KE_809
CAD_#KE_809_801_DMU_TM_005	SCHOTT_SCHWELL_M_SKA_R05_CH01093040	K41, K5B		CATPart	PE-Copolymerisat	

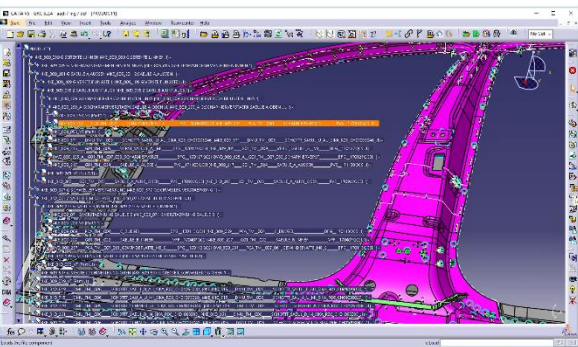
CATIA V5



PDM System (CONNECT)

CAD meta data

working with CAD data CATIA V5



product variants

control of variants



# Implementation - handling CAD data

**version control**

**product variants**

**product structure from CATIA**

**Short description**

Name	Short description
AU513	AU513/6
CAD	4KE_810_553_PCA_TM_015_VERSTAERKUNG...
CAD	4KE_809_655_B_PCA_TM_002_ET_SCHARNIE...
CAD	4KE_806_207_PCA_TM_002_VERST_SCHARNIE...
CAD	4KE_809_745_PCA_TM_022_VERST_SAEULE_C...
CAD	4KE_809_263_G01_TM_018_VERST_SAEULE_C...
CAD	4KE_809_697_DMJ_TM_006_SCHOTT_SA_C_UN...
CAD	4KE_810_391_A_G01_TM_001_VERL_SAEULE_A...
CAD	4KE_810_889_DMJ_TM_004_SCHOTT_SAEUL_D...
CAD	4KE_809_647_DMJ_TM_008_SCHOTT_SAU_L_C...
CAD	4KE_809_697_A_DMJ_TM_005_SCHOTT_SA_C...
CAD	4KE_809_307_G01_TM_020_VERST_SAEULE_D...
CAD	4KE_806_095_PCA_TM_014_SCHOTTTEIL_SAE...
CAD	4KE_809_329_PCA_TM_014_SAEULE_D_INNE...
CAD	4KE_810_555_PCA_TM_009_VERST_DACHREL...
CAD	4KE_810_283_G01_TM_023_SAEULE_A_AUSS...
CAD	4KE_809_111_PCA_TM_020_VERSTEIFUNGST...
CAD	4KE_805_523_PCA_TM_014_SCHOTTTEIL_VE...
CAD	4KE_809_571_DMJ_TM_003_SCHOTT_SAEUL_U...
CAD	4KE_809_285_G01_TM_009_VERST_SAEULE_A...
CAD	8W0_809_625_A_G01_TM_007_033_SCHARNIE...
CAD	4KE_810_215_G01_TM_014_SCHARNIERVERST...
CAD	4KE_809_297_PCA_TM_020_SCHARNIERVERST...
CAD	4KE_810_313_PCA_TM_017_STEGTEIL_SAEU...
CAD	4KE_809_695_PCA_TM_013_VERST_SCHWELL...
CAD	4KE_809_393_PCA_TM_015_VERST_SCHWELL...
CAD	4KE_809_067_PCA_TM_009_VERST_SCHWELL...
CAD	4KE_809_755_G01_TM_016_SCHWELLER_AUS...
CAD	4KE_810_269_G01_TM_016_STEGT_SCHWELL...
CAD	4KE_809_739_G01_TM_021_VERSTAERKUNG...
CAD	4KE_809_801_DMJ_TM_005_SCHOTTT_SCHWEL...

**Attributes**

**CAD meta data**

MaterialID	Nummer	Wandstärke
PE-Copolimerisat	4KE_810_553	1,8mm
PE-Copolimerisat	4KE_809_655_B	1,2mm
PE-Copolimerisat	4KE_806_207	1,5mm
PE-Copolimerisat	4KE_809_745	0,9mm
PE-Copolimerisat	4KE_809_263	0,9mm
PE-Copolimerisat	4KE_809_697	1,5mm
PE-Copolimerisat	4KE_809_647	1,5mm
PE-Copolimerisat	4KE_809_697_A	1,5mm
PE-Copolimerisat	4KE_809_307	0,7mm
PE-Copolimerisat	4KE_806_095	1,1mm
PE-Copolimerisat	4KE_805_523	1,2mm
PE-Copolimerisat	4KE_809_571	1,5mm
PE-Copolimerisat	8W0_809_625_A	2,5mm
PE-Copolimerisat	4KE_809_215	1,1mm
PE-Copolimerisat	4KE_809_297	2,5mm
PE-Copolimerisat	4KE_810_313	0,9mm
PE-Copolimerisat	4KE_809_695	2,1mm
PE-Copolimerisat	4KE_809_393	2,1mm
PE-Copolimerisat	4KE_809_067	2mm
PE-Copolimerisat	4KE_809_755	1,4mm
PE-Copolimerisat	4KE_810_269	1,5mm
PE-Copolimerisat	4KE_809_739	1,5mm
PE-Copolimerisat	4KE_809_801	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

- Representation of
  - Geometric data
  - Connections

**“LiveMode” with interactive locking for instant collaboration**



## CATIA V5\*

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



PRODUCT1 -

- 4KE\_809\_039 G:SEITENTEIL, INNEN (4KE\_809\_039 G:SEITENTEIL, INNEN.1) -
- 4KE\_809\_045 G:SEITENWANDRAHMEN HINTEN INNEN (4KE\_809\_045 G:SEITENWANDRAHMEN HINTEN INNEN.1) -
- 4KE\_809\_201 G:SAEULE A, AUSSSEN (4KE\_809\_201 G:SAEULE A, AUSSSEN.1) -
- 4KE\_809\_109 G:VERSTEIFUNGSTEIL (4KE\_809\_109 G:VERSTEIFUNGSTEIL.1) -
- 4KE\_809\_055 Z:SAEULE A, UNT, AUSS (4KE\_809\_055 Z:SAEULE A, UNT, AUSS.1) -
- 4KE\_810\_209 G:SCHARNIERVERSTAERK UNTEN LINKS (4KE\_810\_209 G:SCHARNIERVERSTAERK UNTEN LINKS.1) -
- 4KE\_809\_293\_A G:SCHARNIERVERSTAERK SAEULE A, OBEN LI. (4KE\_809\_293\_A G:SCHARNIERVERSTAERK SAEULE A, OBEN LI.1) -
- 4KE\_809\_293\_VT (Part1.1) -
- 4KE\_809\_397\_PCA\_TM\_020\_SCHARNIERVERST\_S\_PVS\_170630QCSI (4KE\_809\_297\_PCA\_TM\_020\_SCHARNIERVERST\_S\_PVS\_170630QCSI.1) -
- 4KE\_809\_055\_VT (Part1.1) -
- 4KE\_809\_571\_DMU\_TM\_003\_SCHOTT\_SAEUL\_U\_AU\_SIKA\_R05\_CHO1093046 (4KE\_809\_571\_DMU\_TM\_003\_SCHOTT\_SAEUL\_U\_AU\_SIKA\_R05\_CHO1093046.1) -
- 4KE\_809\_295\_DMU\_TM\_009\_VERST\_SAEULE\_A\_MI\_BFG\_170127QCSI.1) -
- 8W0\_809\_802\_025\_A\_G01\_TM\_007\_033\_SCHARNIERVERST\_BFG\_170127QCSI.1) -
- 4KE\_809\_920\_017\_G01\_TM\_024\_SAEULE\_A, AUSSSEN\_PVS\_171103QCSI.1) -
- 4KE\_809\_201\_VT (Part1.1) -
- 4KE\_810\_283\_G01\_TM\_023\_SAEULE\_A, AUSS, OBEN\_PVS\_170922QCSI (4KE\_810\_283\_G01\_TM\_023\_SAEULE\_A, AUSS, OBEN\_PVS\_170922QCSI.1) -
- 4KE\_809\_377 G:SCHWELLER VERSTAERKUNG (4KE\_809\_377 G:SCHWELLER VERSTAERKUNG.1) -
- 4KE\_810\_073 Z:SAEULE B, M, SCHWELL (4KE\_810\_073 Z:SAEULE B, M, SCHWELL.1) -
- 4KE\_809\_223 G:SAEULE B, INNEN (4KE\_809\_223 G:SAEULE B, INNEN.1) -
- 4KE\_809\_071 G:VERSTAERKUNG SAEULE B (4KE\_809\_071 G:VERSTAERKUNG SAEULE B.1) -
- 4KE\_809\_223\_VT (Part1.1) -
- 4KE\_809\_069\_PCA\_TM\_004\_C\_BUEGEL\_BFG\_170113QCSI (4KE\_809\_069\_PCA\_TM\_004\_C\_BUEGEL\_BFG\_170113QCSI.1) -
- 4KE\_809\_227\_G01\_TM\_022\_SAEULE\_B, INNEN\_VFF\_170407QCSI (4KE\_809\_227\_G01\_TM\_022\_SAEULE\_B, INNEN\_VFF\_170407QCSI.1) -
- 8V0\_809\_237\_PCA\_TM\_007\_061\_GEWINDERPLATTE\_M8\_S\_BFG\_170113QCSI (8V0\_809\_237\_PCA\_TM\_007\_061\_GEWINDERPLATTE\_M8\_S\_BFG\_170113QCSI.1) -
- 4KE\_810\_199 G:SCHLIESSTEIL SAEULE B (4KE\_810\_199 G:SCHLIESSTEIL SAEULE B.1) -
- 4KE\_810\_073\_VT (Part1.1) -
- 4KE\_809\_597 G:STEGTEIL, SCHWELLER SG OBEN (4KE\_809\_597 G:STEGTEIL, SCHWELLER SG OBEN.1) -
- 4KE\_809\_039\_VT (Part1.1) -
- 4KE\_810\_619\_DMU\_TM\_006\_SCHOTT\_SAEUL\_B\_AU\_SIKA\_R07\_CHO1093030 (4KE\_810\_619\_DMU\_TM\_006\_SCHOTT\_SAEUL\_B\_AU\_SIKA\_R07\_CHO1093030.1) -
- 4KE\_810\_715\_DMU\_TM\_006\_SCHOTT\_SAU\_A\_U\_MI\_SIKA\_R06\_CHO1093029 (4KE\_810\_715\_DMU\_TM\_006\_SCHOTT\_SAU\_A\_U\_MI\_SIKA\_R06\_CHO1093029.1) -
- 4KE\_810\_729\_DMU\_TM\_005\_SCHOTT\_SCHWELL\_AU\_SIKA\_R07\_CHO1093048 (4KE\_810\_729\_DMU\_TM\_005\_SCHOTT\_SCHWELL\_AU\_SIKA\_R07\_CHO1093048.1) -
- 4KE\_810\_261\_DMU\_TM\_006\_SCHOTT\_SAEUL\_B\_IN\_SIKA\_R06\_CHO1093033 (4KE\_810\_261\_DMU\_TM\_006\_SCHOTT\_SAEUL\_B\_IN\_SIKA\_R06\_CHO1093033.1) -
- 4KE\_809\_025\_DMU\_TM\_006\_SCHOTT\_SCHW\_Y\_L\_O\_SIKA\_R06\_CHO1093042 (4KE\_809\_025\_DMU\_TM\_006\_SCHOTT\_SCHW\_Y\_L\_O\_SIKA\_R06\_CHO1093042.1) -

product structure in CATIA same as in TDM and PDM

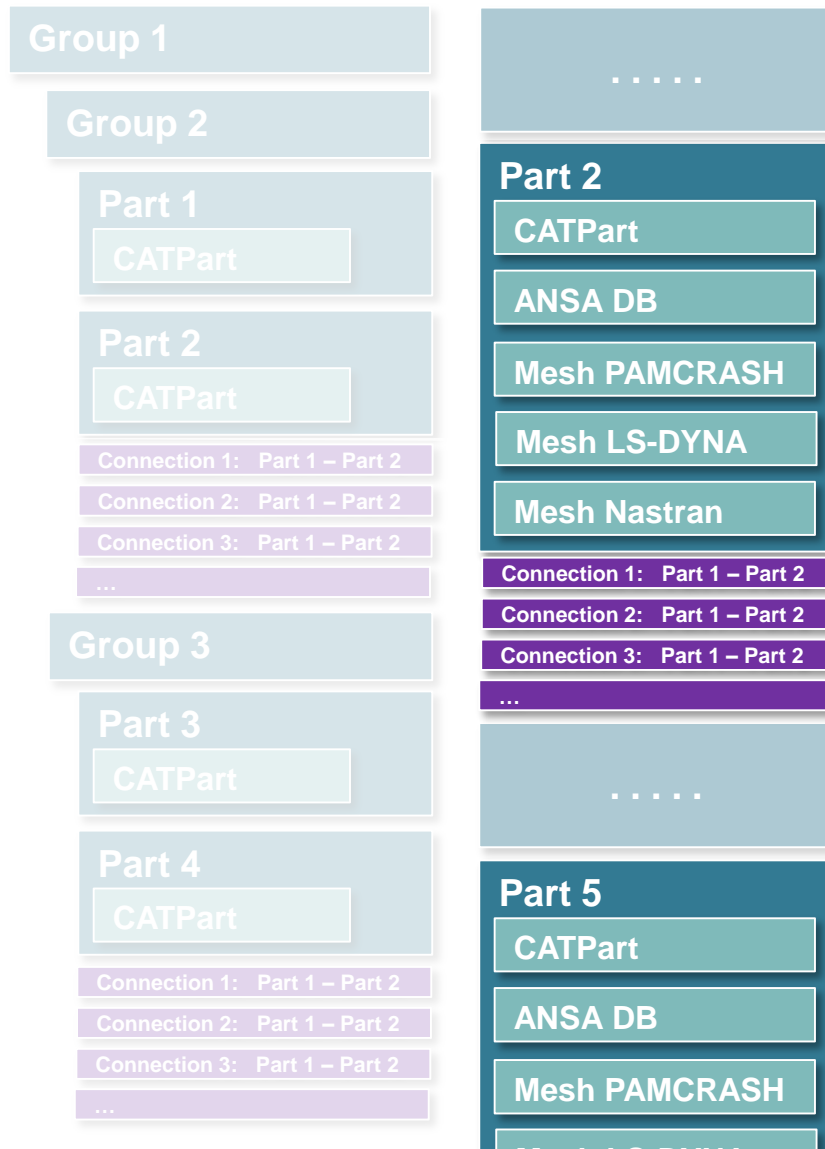
one part is locked in design mode but the whole structure is loaded

all connections are updated from TDM

Loads the file component

c:Load





## 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

## Body18

product structure from CATIA

Components (PV:107)

Name

- 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
- 4KE\_809\_737 Z:VERSTET SAEULE A
- 4KE\_809\_055 Z:SAEULE A,UNT.AUSS
- 4KE\_809\_293\_A G:SCHARNIERVERSTAERK SAEULE A OBEN
- 4KE\_810\_389 G:SCHARNIERVERSTAERKUNGEN LINKS
- 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

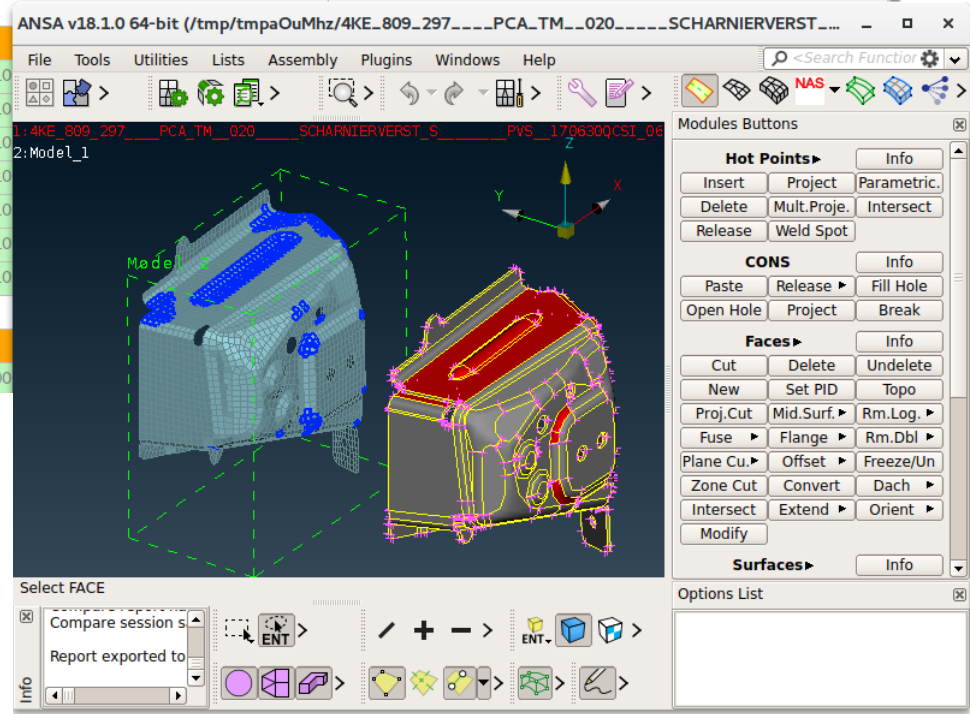
Geometry as CATPart

Mesh as ANSA DB

Assemblies for different solvers

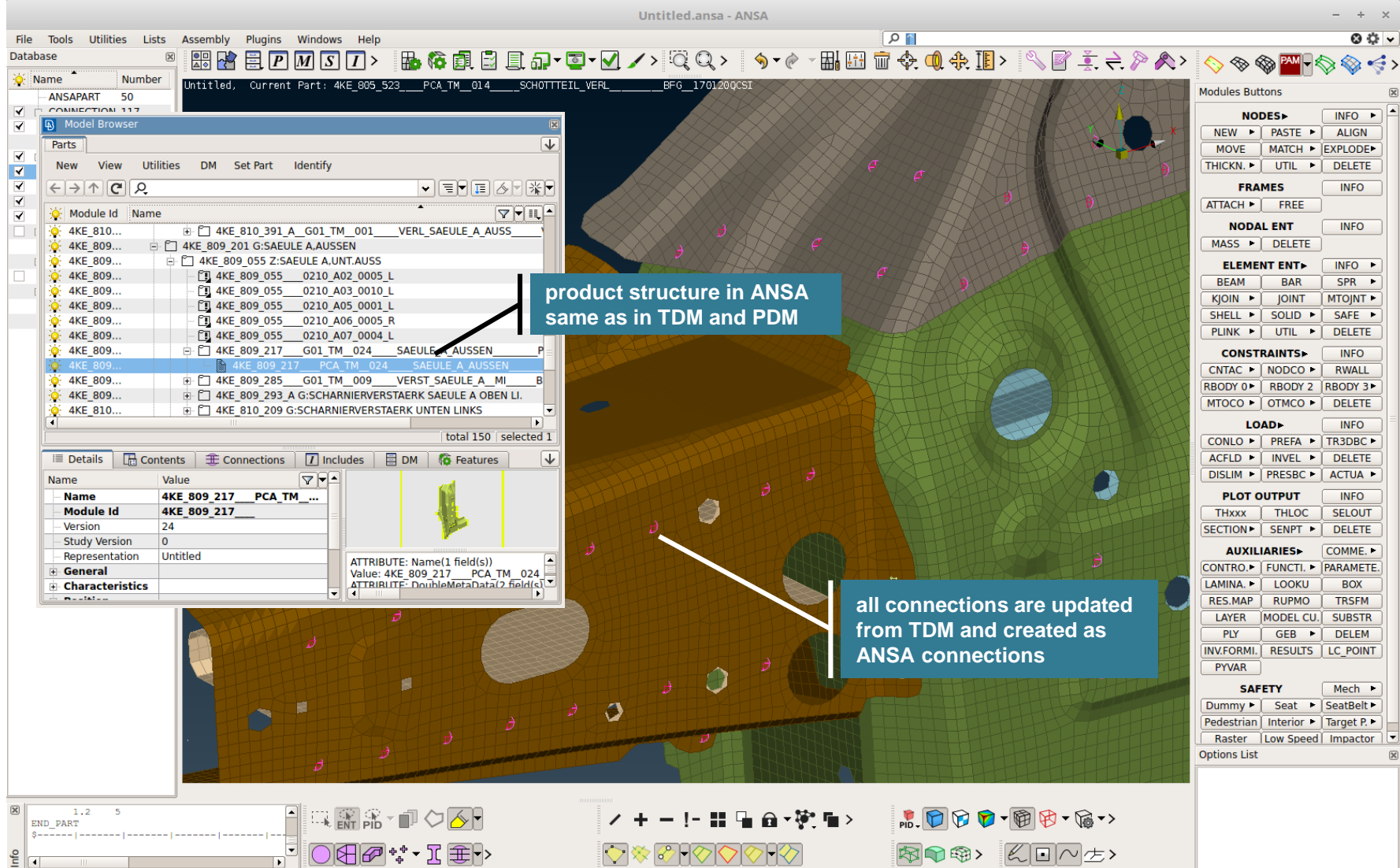
Container for all data related to one part

Name	Short description	FileType	Disziplin	MaterialID	Nummer	Wandstärke	User metadata
AU516_1	AU513/6		MESH				
Information: 4KE_809_297_... (2 components)							
CAD	4KE_809_297_..._PCA_TM_..._020_..._SCHARNIERVERST_S_...	CATPart	CAD	CR330Y590T-DP-GI40/40-U	4KE_809_297_...	2.	
CAD	4KE_809_297_..._PCA_TM_..._020_..._SCHARNIERVERST_S_...	ansa	MESH	CR330Y590T-DP-GI40/40-U	4KE_809_297_...	2.	
VT	4KE_809_293_..._0210						
VT	4KE_809_293_..._0210						
VT	4KE_809_293_..._0210						
VT	4KE_809_293_..._0210						
VT	4KE_809_293_..._0210						
VT	4KE_809_293_..._0800						

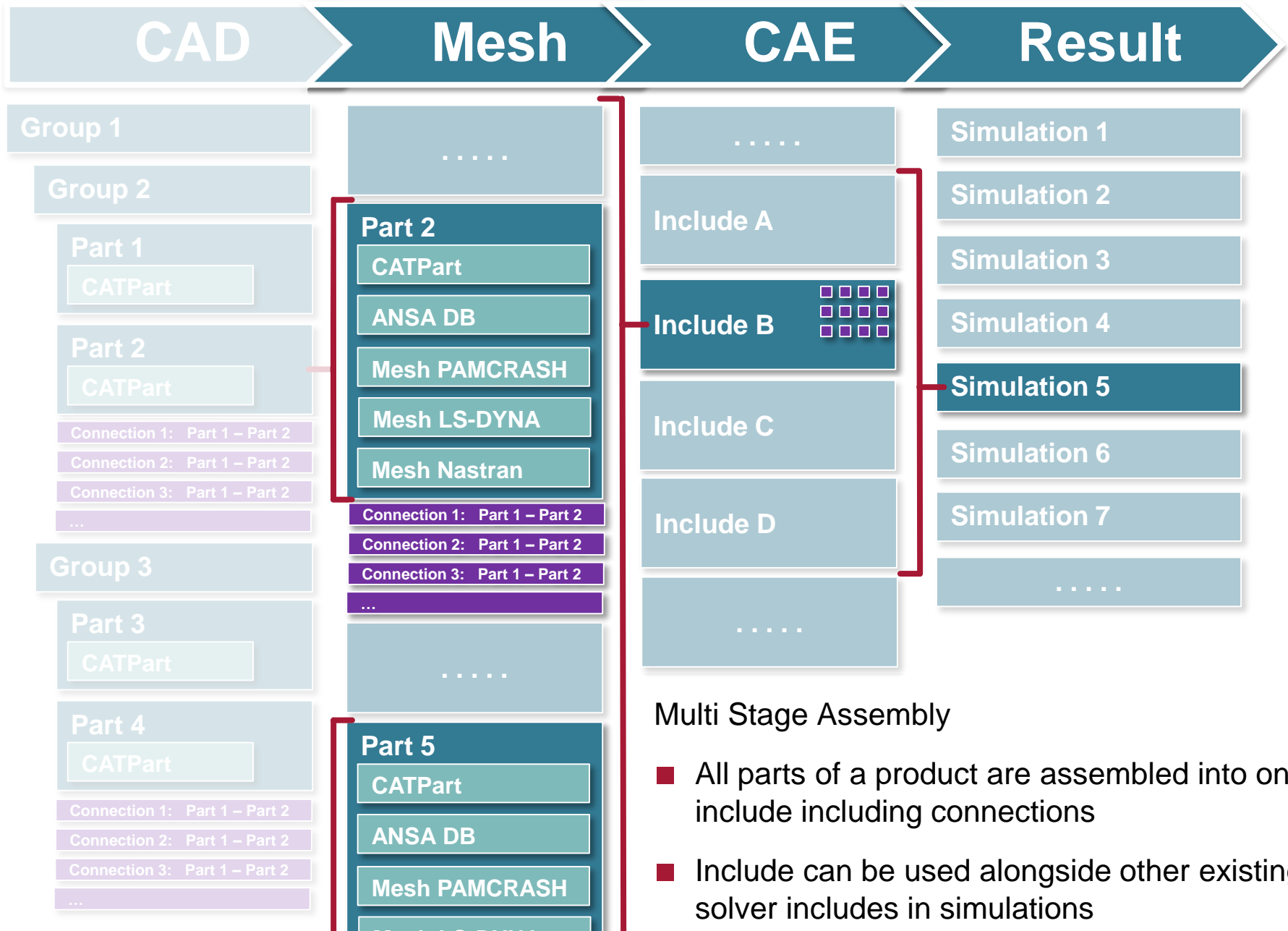


- Geometry and Mesh are stored together
- Whole product or groups can be opened
- Comparing of mesh and geometry
- Assemblies can create includes for multiple solvers

## ANSA



# 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
info_gruppen.py		1
info_gruppen.py		2
Include-Zwischen	inter_inclu_def	
Header Projekts	Pyvar_Def	
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)**

- 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

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

## CAD

**Assembly Tree:**

- 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)**

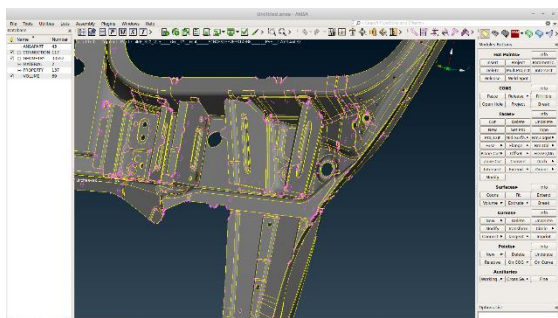
- CAE Zusammenbau LS-DYNA
  - AU513\_1xx\_BK\_PF\_EU\_L\_VD\_-K5B-L0L-3FA\_-0107
  - AU516\_1xx\_BK\_PF\_CN\_L\_VD\_-K4H-L0L-3FA\_-0107
  - AU516\_1xx\_BK\_PF\_EU\_L\_VD\_-K4H-L0L-3FA\_-0107
- CAE Zusammenbau NASTRAN
- CAE Zusammenbau PAM-CRASH

Includes for different product variants are created from the same data

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.

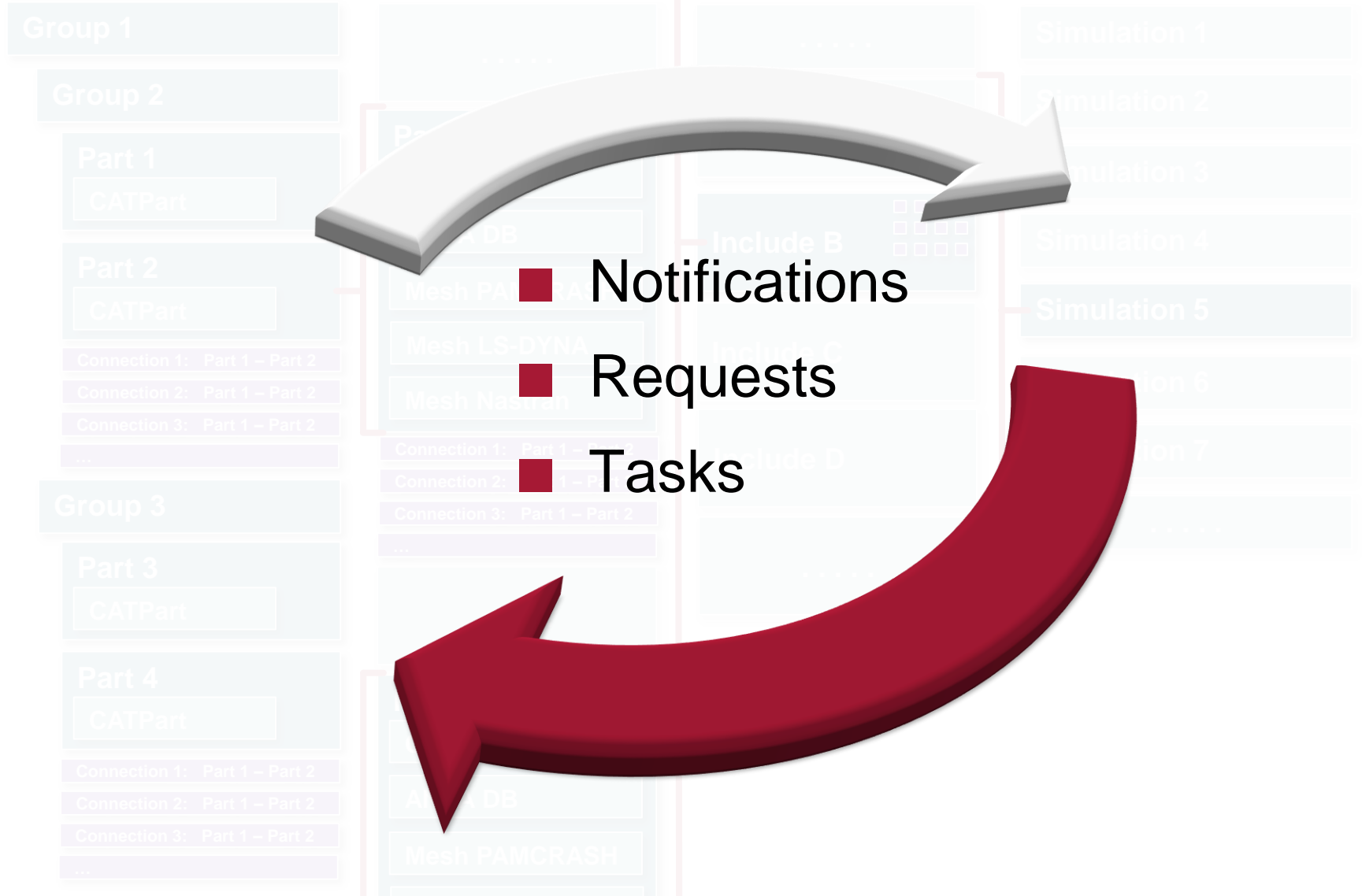
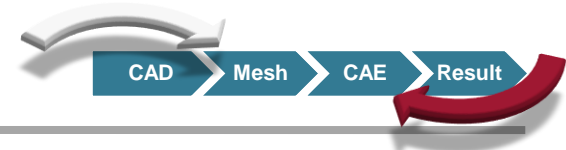
working on the simulation model

## ANSA



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

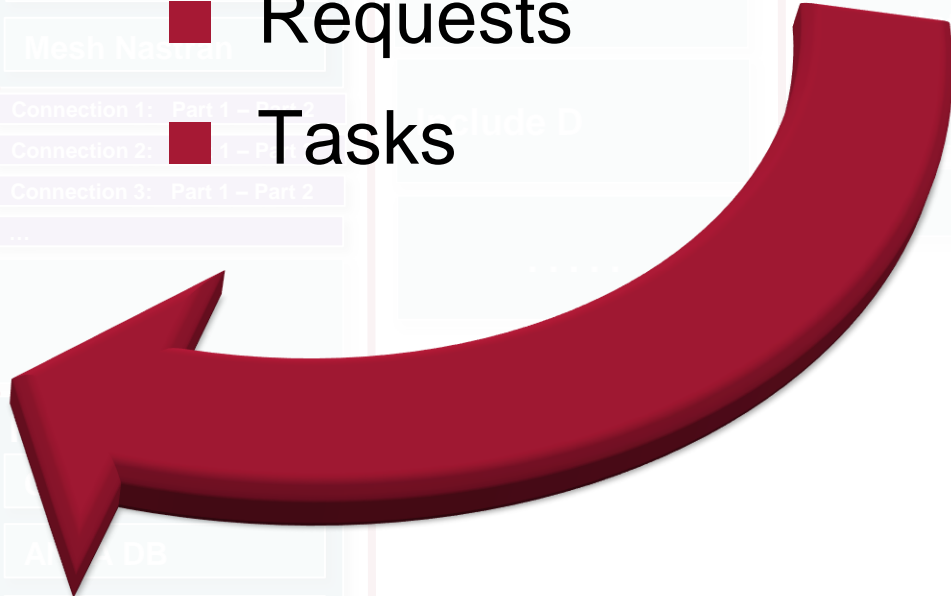
# Implementation - *project management*



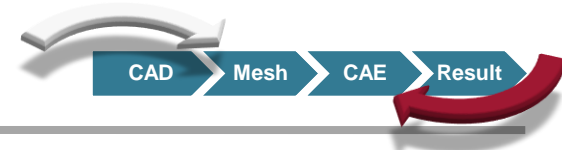
■ Notifications

■ Requests

■ Tasks

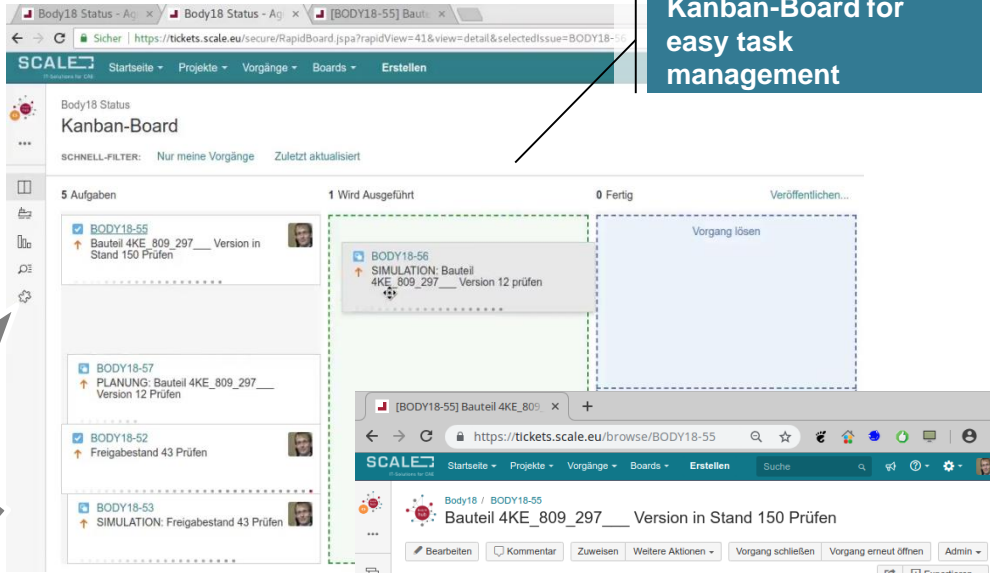
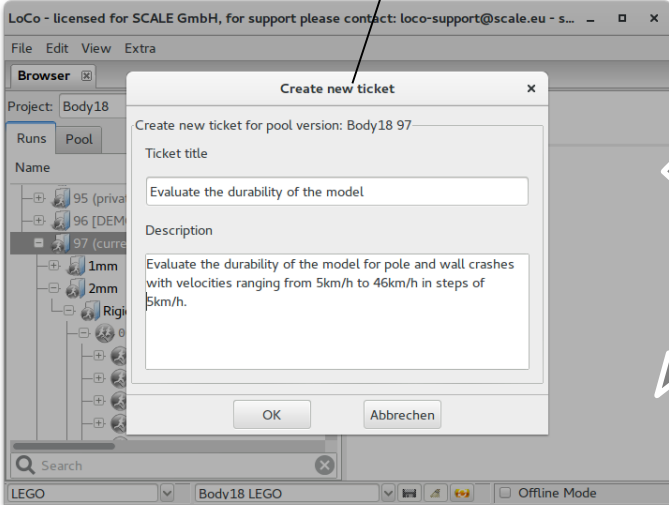


# Implementation - *project management*

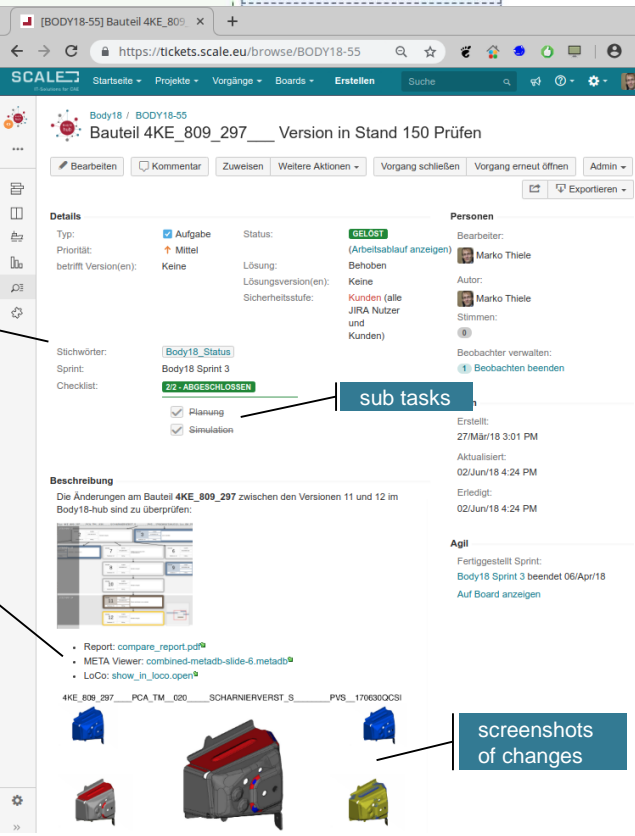


Tasks are created directly with the desktop clients

Kanban-Board for easy task management



detailed task description with automatically created content

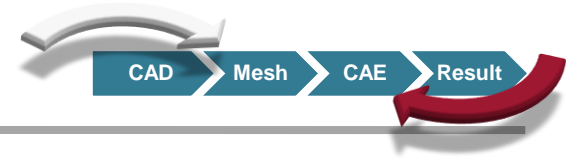


sub tasks

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



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

