

# SIMULIA - Simulation based Design for PLM

Sweden PLM Forum – Göteborg –

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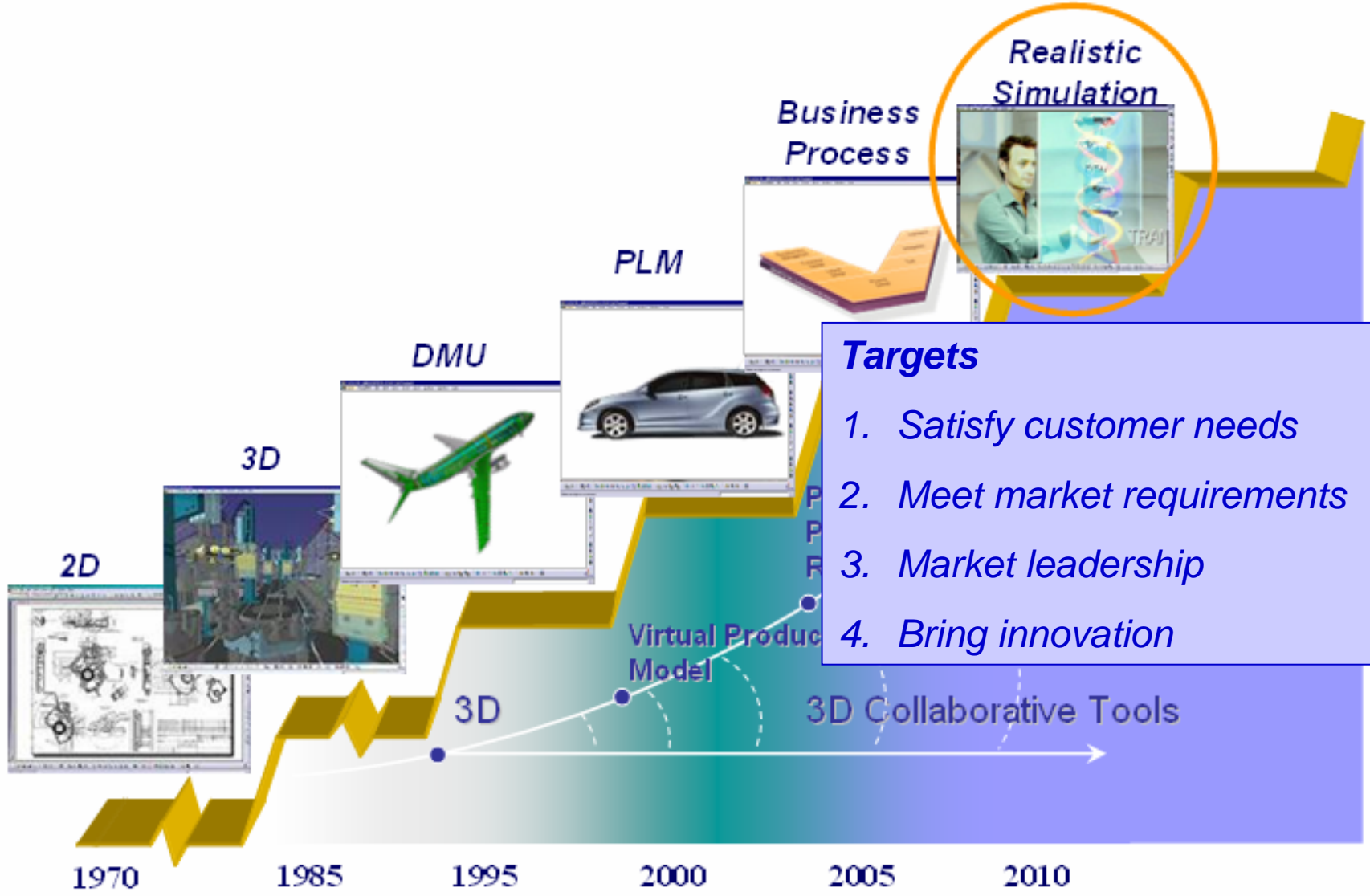


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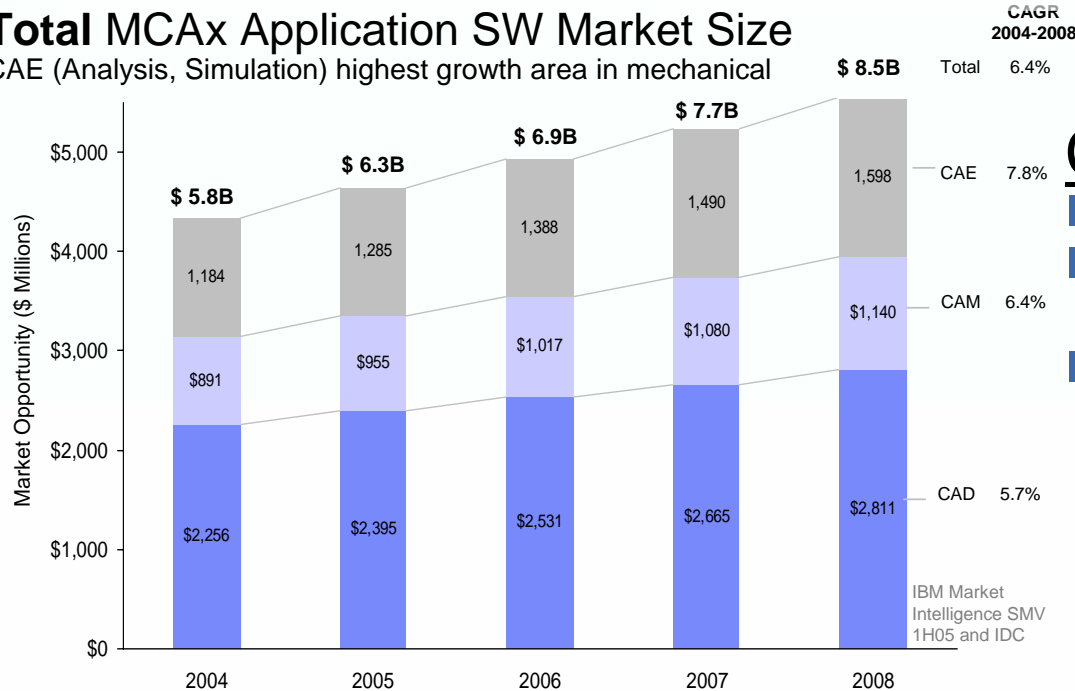
# Das Produkt-Ökosystem PLM Reifegrad



# Realistic Simulation : Market opportunity

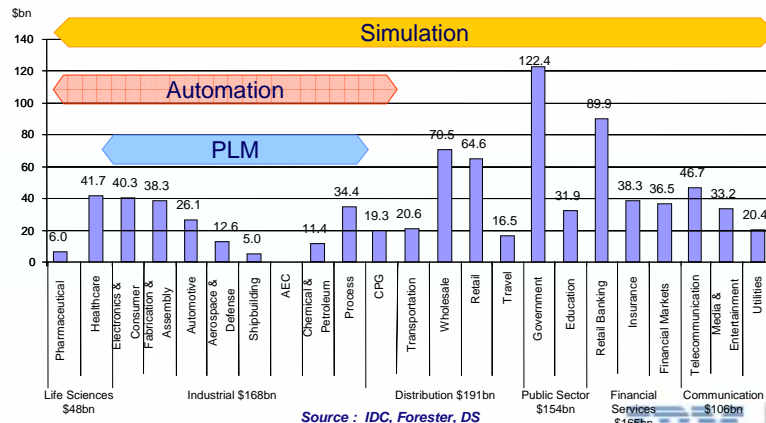
## Total MCAx Application SW Market Size

CAE (Analysis, Simulation) highest growth area in mechanical



## CAE

- 1 \$ sw in CAE for 2 \$ in CAD
- CAE market growth : + 50 % by 2009
- DS # 3 WW vendor in CAE with about 180 m\$ sw sales → Target is to become #1 or #2 by 2008



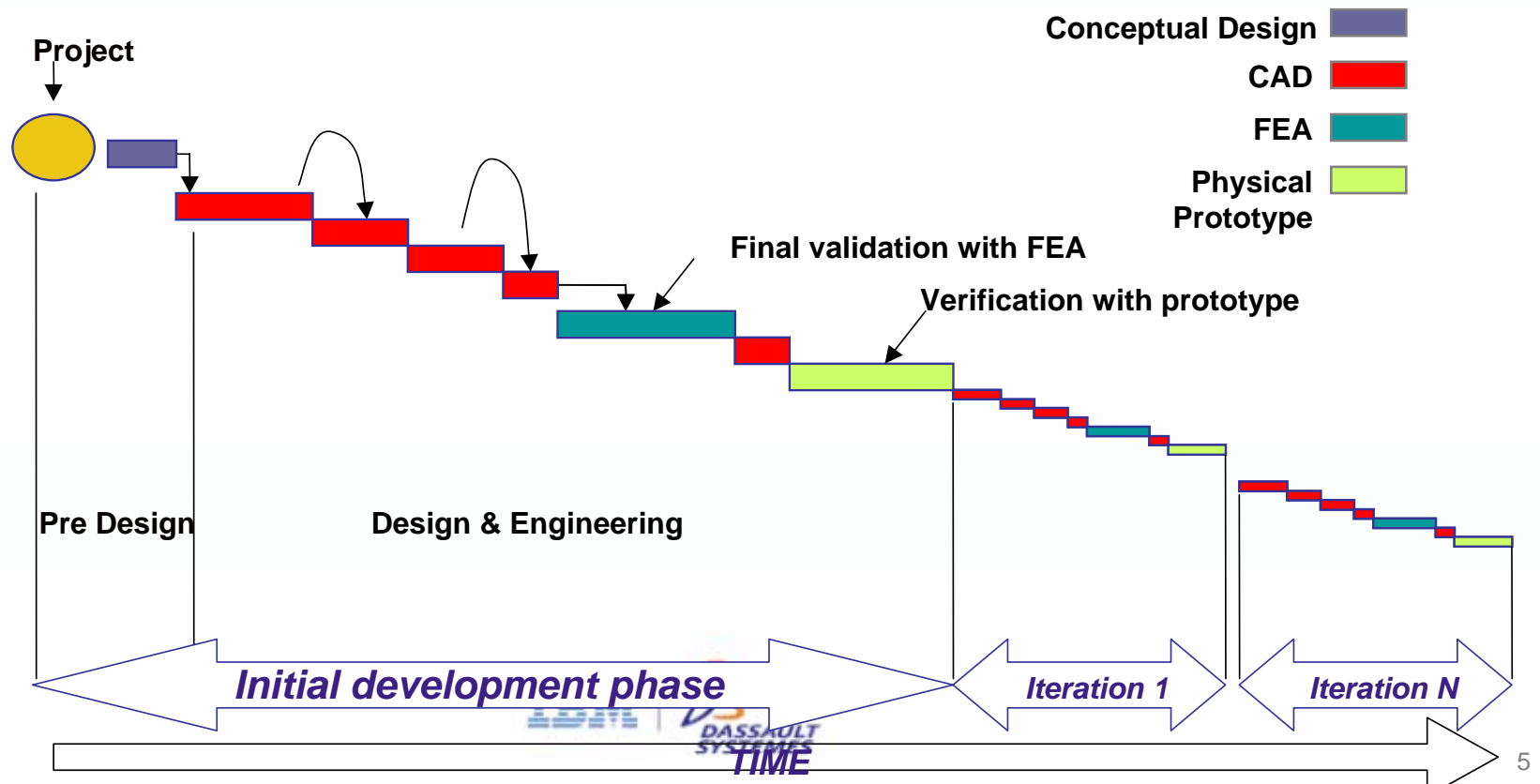
## Beyond CAE

- SIMULIA promise to address needs in other than PLM markets

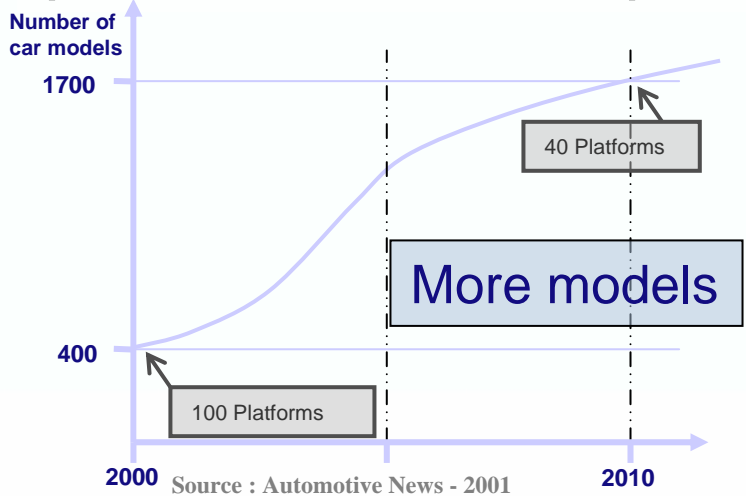


# Simulation and traditional CAE approach

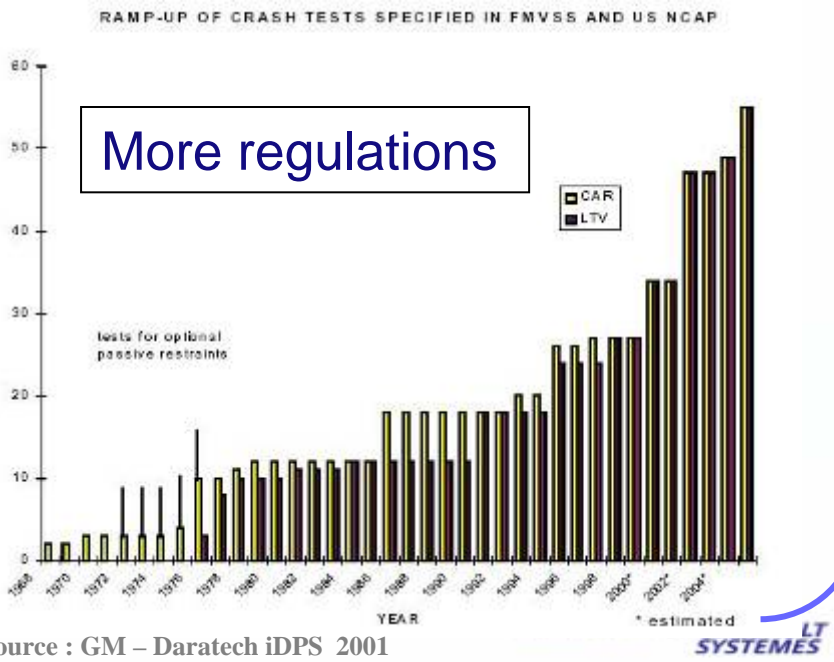
- Late in design cycle / iteration → limited impact on design
- Often supported by physical prototype → costs, time
- Done by Specialist with tools poorly integrated to Design tools
- Long cycle times
- Extreme diversity of disciplines & codes → no integration, data duplication ,..
- No / limited integration between CAE tools → no multiphysic optimization



# Market trends drive significant changes in the use of physical simulation ( ex: Automotive BiW)








Drastic improvement of CAE cycle times needed → new process, new tools

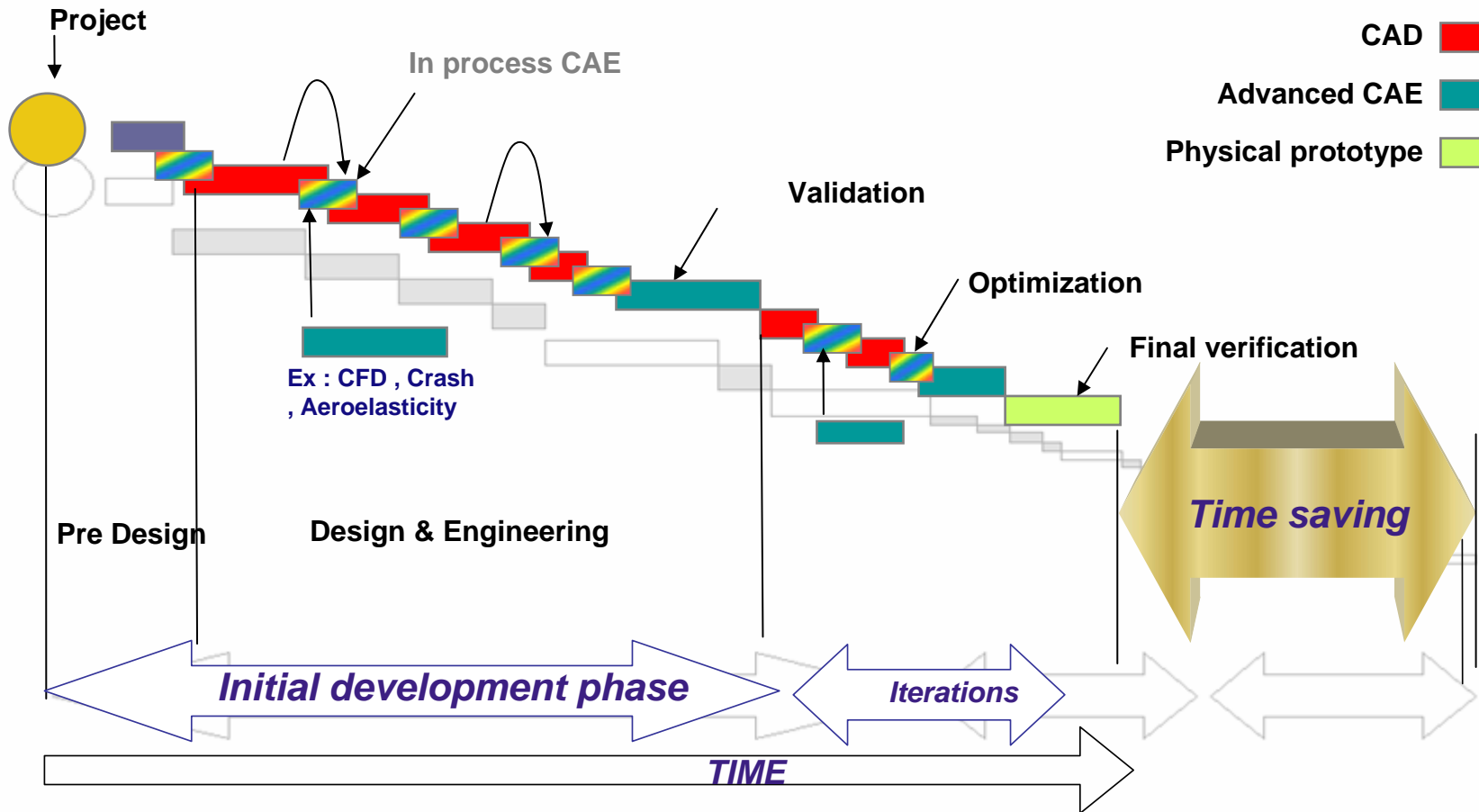


> 5 times more Simulation by 2010

Source : GM - Daratech iDPS 2001

# DS integrated « in process » CAE approach

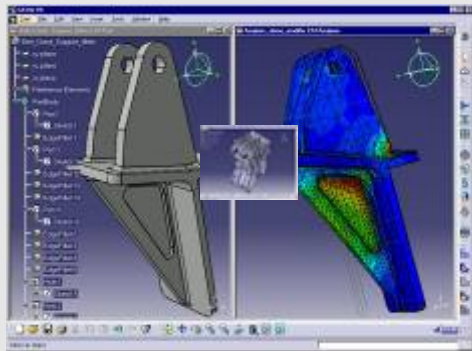
- Conceptual Design 
- In process CAE 
- CAD 
- Advanced CAE 
- Physical prototype 



# DS Strategy : Simulation For All

Manager / Designer / Partners /...

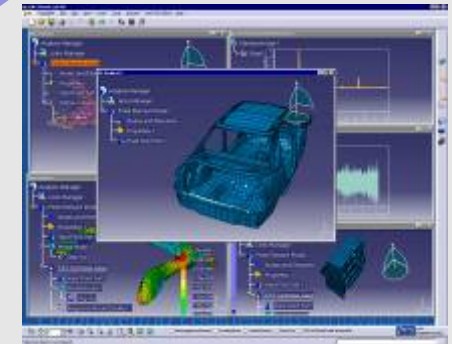
Engineer



Results should be simple to understand



Analyst Specialist



Understand Complex Physics  
Must be able to try any solution

Provides Methodologies & Process



Participate to the Product Simulation

■ Collaborative environment, for both Manager, Engineer & Specialist

- Find Issue Sooner, Reduce Cost
- Increase product Quality & Innovation





# DS Simulation aligned on DS PLM Fundamentals



## *Process Centric*

- Industry specific business process optimization



## *Collaborative Workspace*

- Pervasive 3D based communication & collaboration



## *PPR*

- Unique Product, Process and Resource description & integration model



## *Knowledge*

- Capturing sharing and re-applying corporate knowledge



## *Open architecture*

- Openness and extension through component based architecture and community



# DS Roadmap for Simulation

## ■ Unified simulation environment

- Highly technical and wide ranging simulation discipline

➔ *Making simulation as a main part of the product development cycle*

## **Realistic Simulation**



**ABAQUS**

**DS  
SIMULIA**

*Open scientific platform*

*"The World is Non Linear"*

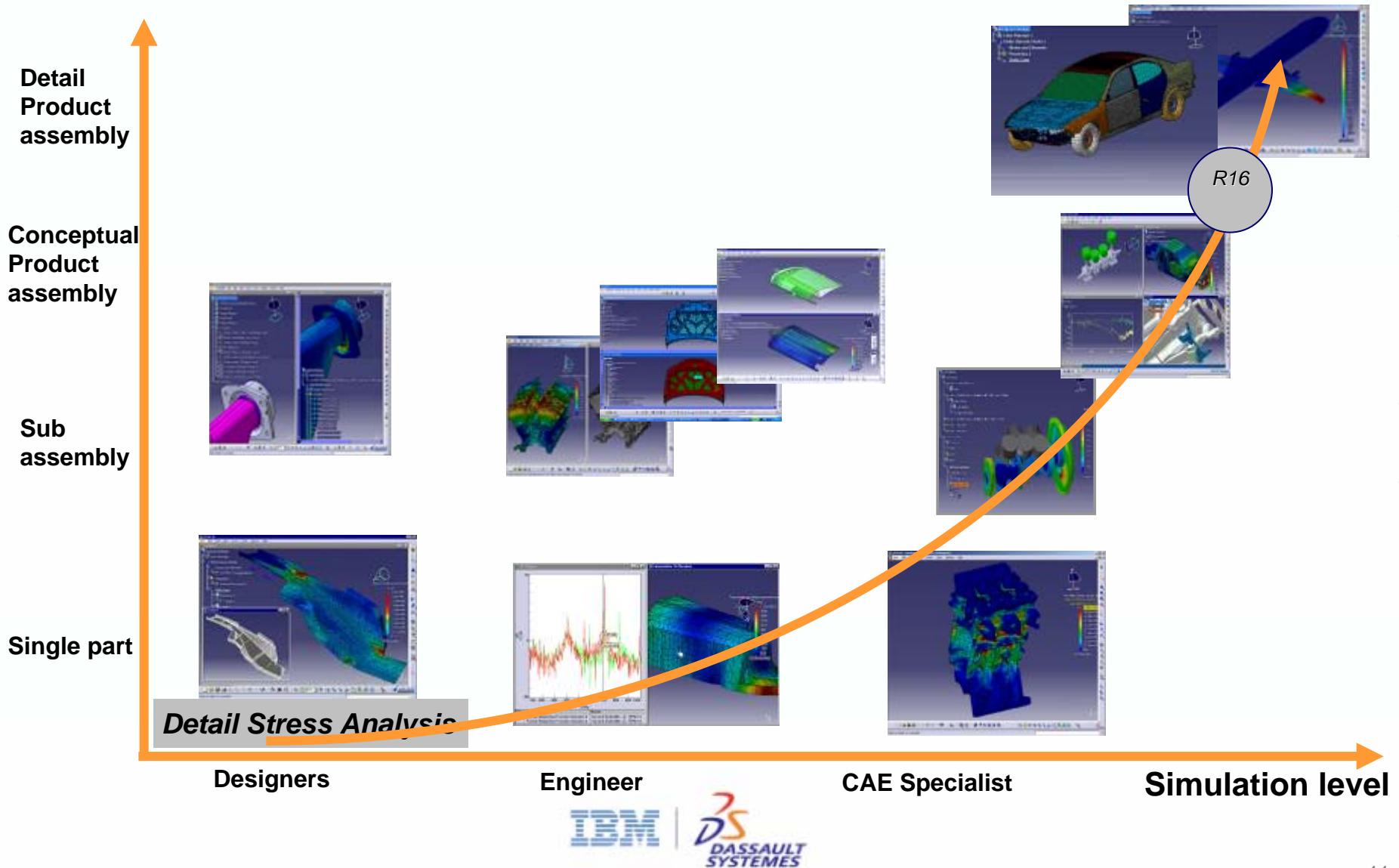
V5 Simulation  
Products and  
CAA V5  
Partners

CAA<sup>V5</sup>  
BASED



**DASSAULT  
SYSTEMES**

# CATIA V5 Simulation Products and CAA V5 Partners ready for single-part to full product simulation

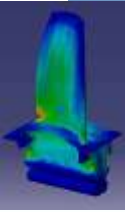


# CATIA V5 Analysis Portfolio



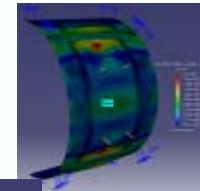
## Generative Part Structural Analysis 1&2 (GP1 & GPS)

Transparent and automatic stress & vibration analysis for single parts, integrating simulation and design specifications, with the core application of CATIA V5 analysis



## FEM Surface (FMS)

Generates associative mesh from complex surface parts, with advanced control on mesh specifications.



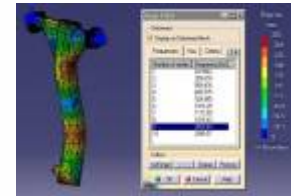
## FEM Solid (FMD)

- GPS Octree with advanced parameters for solid meshing  
- Tetrahedron filler (GHS3D):



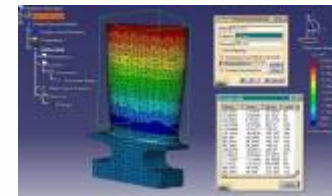
## Generative Assembly Structural Analysis (GAS)

Addresses transparent, integrated and automatic stress and vibration analysis for assemblies of parts : surface, solid, and hybrid.



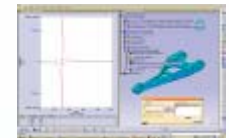
## ELFINI Structural Analysis (EST)

Performs advanced pre, post processing and solving with complementary analysis options.



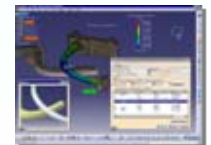
## Generative Dynamic Analysis (GDY)

Easily and quickly predict the dynamic response of a system submitted to dynamic excitations



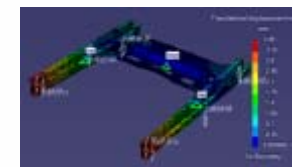
## ANalysis Review (ANR)

Analysis results visualization in DMU environment, including navigation, animation, and interference analysis with deformed parts



## Tolerance Analysis of Deformable Assembly (TAA)

Easily predicts the tolerancing specified on an assembly taking into consideration the entire sheet-metal assembly process.



# DS CAA V5 ecosystem to cover end to end simulation process

CAAV5  
BASED



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# LMS Becomes the Premier SIMULIA Partner

## LMS is First Company to Join Dassault Systèmes' New SIMULIA Partner Program

02-20-2006

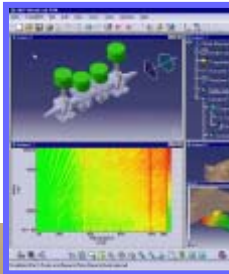
**Innovative engineering company embraces program that unites CAA V5 and ABAQUS alliance programs**

Cambridge, Mass., February 20, 2005 - Dassault Systèmes (DS) (Nasdaq: DASTY; Euronext Paris: #13065, DSY.PA), a world leader in 3D and Product Lifecycle Management (PLM) solutions, and engineering innovation leader LMS International today announced that LMS has become the first company to join Dassault Systèmes' new SIMULIA Partner Program, which unites simulation partners from the ABAQUS Alliance Program with Dassault Systèmes' Component Application Architecture (CAA V5) community. The V5-based LMS Virtual.Lab applications will be available as partner products within the SIMULIA ecosystem.

"LMS is always at the forefront of our partners in deploying applications based on our innovative architecture and have taken the lead in delivering products which demonstrate the applicability of V5 to realistic simulation," said Mark Goldstein, CEO of SIMULIA. "As our premier partner for simulation, LMS is an integral part of the SIMULIA strategy. By leveraging the open platform of SIMULIA, LMS will be able to deliver enhancements and new functionality, and expand Virtual.Lab for complimentary applications in structural analysis and functional performance simulation."

SIMULIA is the Dassault Systèmes open multi-physics platform that supports realistic simulation for a wide range of industries. By significantly reducing the need for the physical testing of products, SIMULIA accelerates innovation and reduces the cost of ownership

DS and LMS  
and opera

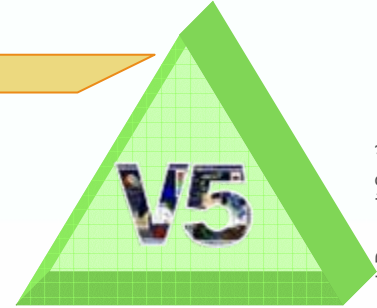


LMS established  
CAA V5 based Re  
2000

Technologies  
erage.



Solutions



Infrastructure



Technologies



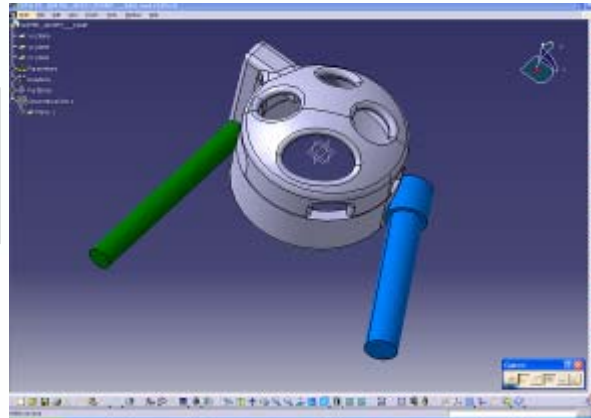
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ses

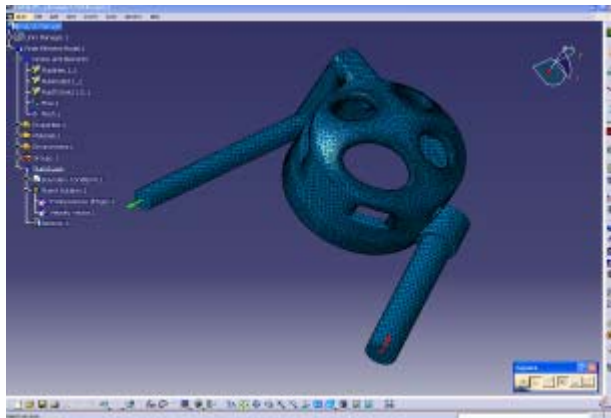


# Fluent For CATIA, a V5 integrated solution taking fully advantage of DS and FLUENT leading technologies & environments

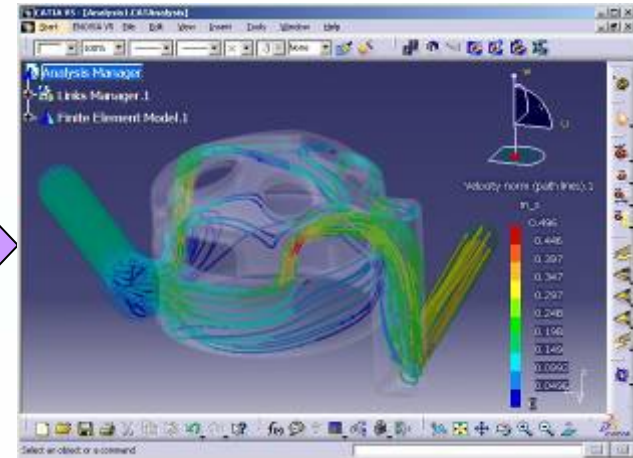
Automated flow volume extraction and meshing



Generative & Knowledge based design optimization



Simulation set-up and automated solution steering



# Advantage using CATIA V5 integrated CAE process & solutions

## Engineering Time breakdown for a typical Analysis project

Time reference : 100 for a Non V5 integrated process, Source : DS - Results measured by customers on various simulation process.

1ST ITERATION

TASK	% OF ENGINEER TIME	
	Non V5 Integrated Process	V5 Integrated Process
Data & Geometry preparation	35	5
Meshing	25	10
Other preprocessing & Solving	20	15
Post processing	20	10
<b>Total</b>	<b>100</b>	<b>40</b>
	Saving with V5 →	60%

2ND & FOLLOWING ITERATIONS

TASK	% OF ENGINEER TIME	
	Non V5 Integrated Process	V5 Integrated Process
Data & Geometry preparation	20	5
Meshing	15	5
Other preprocessing & Solving	10	5
Post processing	10	5
<b>Total</b>	<b>55</b>	<b>20</b>
	Saving with V5 →	64%

→ 60 + % Improvement of CAE cycle times



# Benefits of a PLM in process & integrated CAE strategy

- CAE earlier in Design process → More impact of simulation on design → better performance & physical properties, less physical prototypes
- Parametric design → More design alternatives
- Multiphysic optimization
- Unified and simplified GUI → better learning curve, less training , better designer / analyst communication
- Single / Simple database → less time / errors in data exchanges
- Simulation data managed as part of PLM

# DS Roadmap for Simulation

## Realistic Simulation



### Unified simulation environment

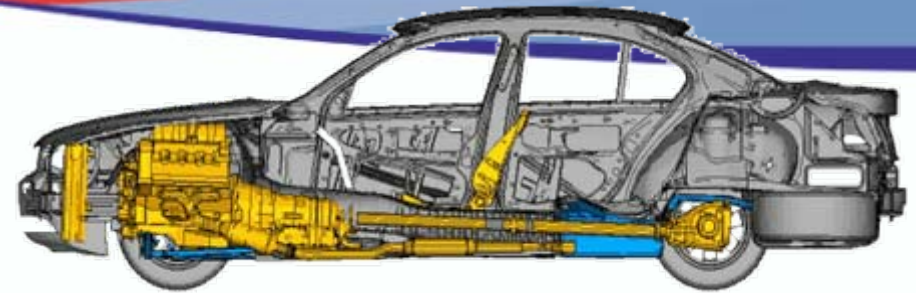
- Highly technical and wide ranging simulation discipline

→ Making simulation as a main part of the product development cycle



Open scientific platform

# ABAQUS & SIMULIA

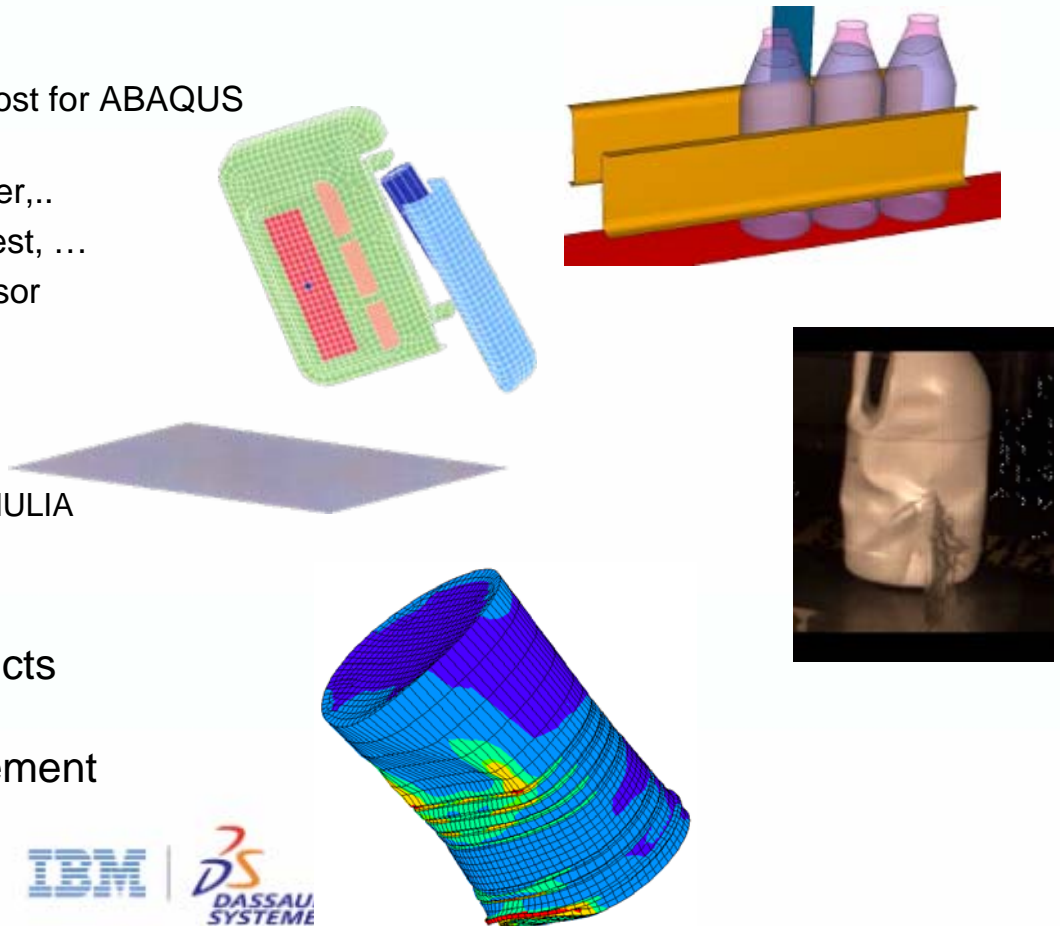


## ■ ABAQUS

- WW leader in non linear analysis
- \$ 100 M+ revenue in 2005
- Products
  - ⇒ AFC ( Abaqus For CATIA ) Pre/post for ABAQUS implicit , V5 based
  - ⇒ ABAQUS Implicit : non linear solver,...
  - ⇒ ABAQUS Explicit : Crash , Drop test, ...
  - ⇒ ABAQUS CAE : pre / post processor

## ■ DS October 4th 2005 announcement

- Completion of ABAQUS acquisition
- New brand creation for simulation : SIMULIA
  - ⇒ World headquarters for ABAQUS
  - ⇒ DS CAE simulation products development
  - ⇒ CAA Partnership management



# DS Roadmap for Simulation

## ■ Unified simulation environment

- Highly technical and wide ranging simulation discipline

→ *Making simulation as a main part of the product development cycle*



**ABAQUS**

**Realistic  
Simulation**



**DS  
SIMULIA**

*Open scenario platform*

*"The World is Non Linear"*

V5 Simulation  
Products and  
CAA V5  
Partners



**DASSAULT  
SYSTEMES**

# Three collaborative environments to Design, Experience, Produce & Automate

3D  
COLLABORATION

DESIGN



DS  
CATIA



EXPERIENCE



DS  
SIMULIA



DS  
DELMIA

PRODUCE & AUTOMATE

DS  
ENOVIA

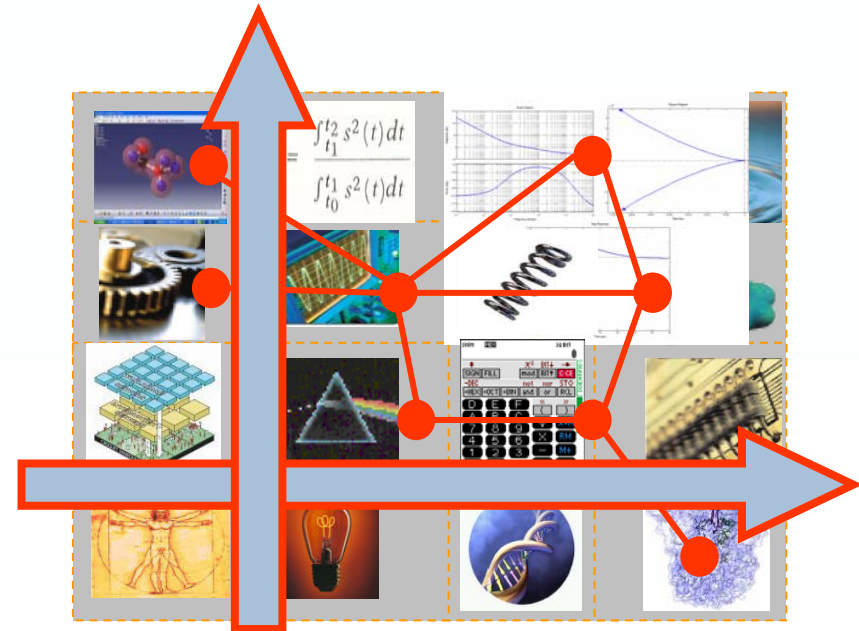
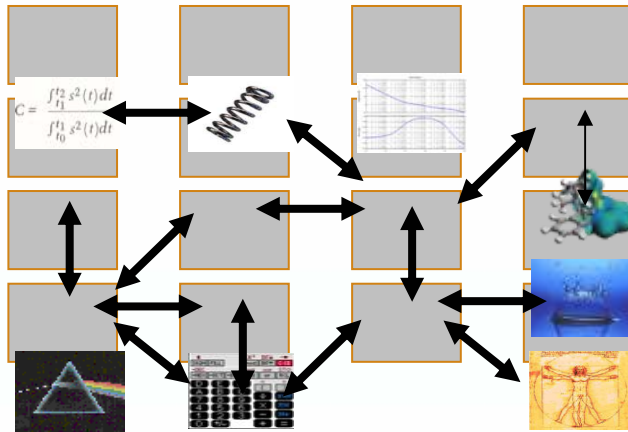


LIFE CYCLE MANAGEMENT

DS  
SMARTEAM

# SIMULIA Vision

- An open multi-physics platform for realistic simulation
- A unified approach to what is today a fragmented landscape of non-interoperable solutions in multiple simulation domains



... to **collaborative scientific process**  
based on an  
**open integrated multi-physics**  
**simulation platform**

**From home grown or niche  
unconnected simulation  
applications...**

# Conclusion

- DS in Simulation : Proven Strategy & Vision
- Clear & Structured market approach
- #3 WW → Target to be # 1 or 2 by 2008
- Unique CAA V5 ecosystem adapted to the CAE niche market
- Leading PLM integrated simulation solutions meeting market requirements for cycle time reduction and product performance optimization

Thank You for your attention  
Any Questions ?

