

# Managing Simulation in the Product Life Cycle using DB2

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- Product Development Trends
- Visual *DSS* - The End-to-End Decision Support System for CAE
  - Multi-Domain Compute Model Manager
  - Process & Workflow Manager
  - Simulation Content & Data Manager
  - Decision Support & Reporting Manager
- Summary

## The Situation

- ⦿ Increasing reliance on multi-domain realistic simulation, which spans multiple engineering disciplines, correlated with real world results.
  - ⦿ Increased number of Simulations
  - ⦿ Increased number of Simulation Types
  - ⦿ Large amount of diverse data
- ⦿ Complex Workflow

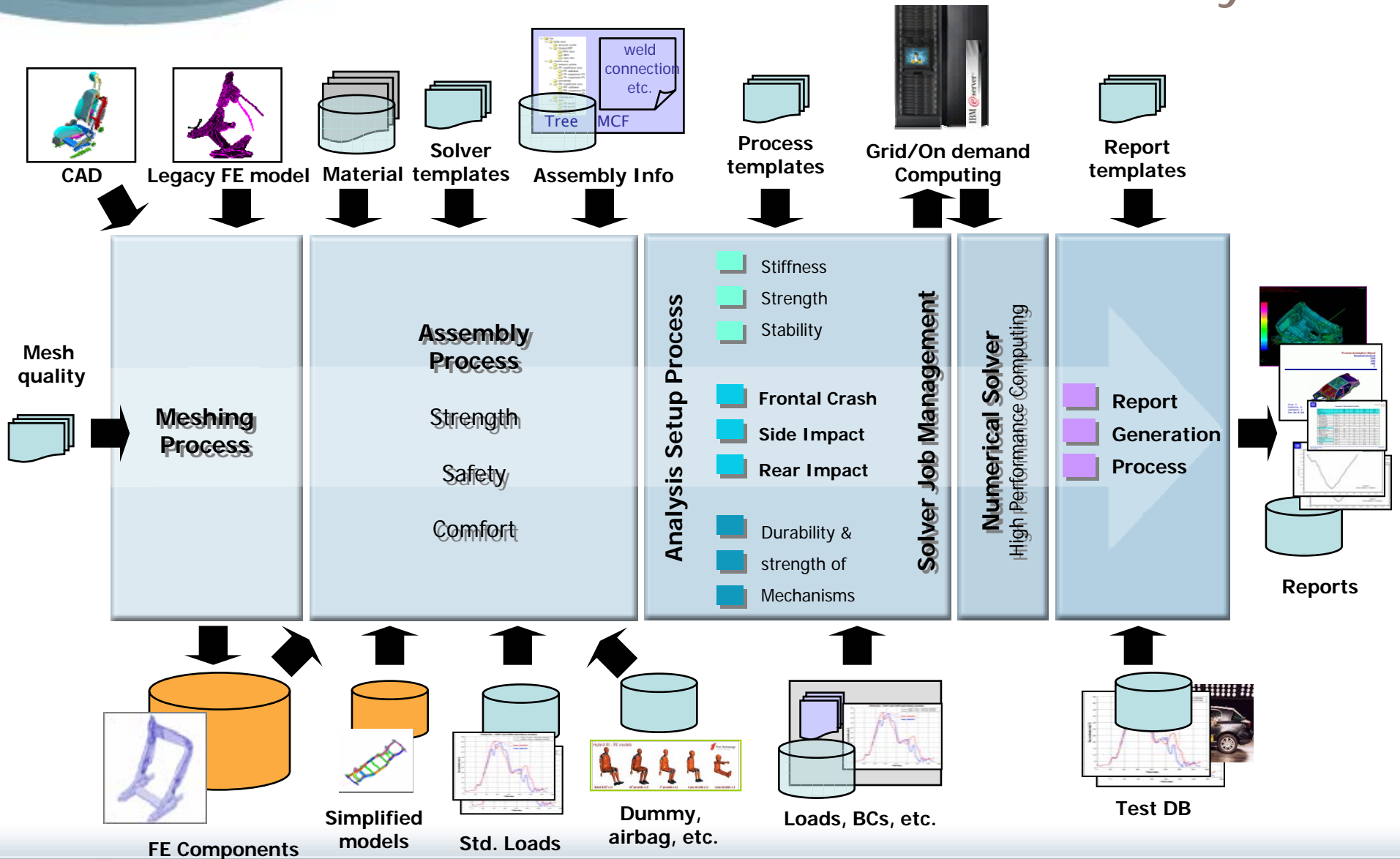
## The challenge

- ⦿ An heterogeneous application ecosystem
- ⦿ A multi-domain approach with distributed data
- ⦿ A highly organization dependant data management

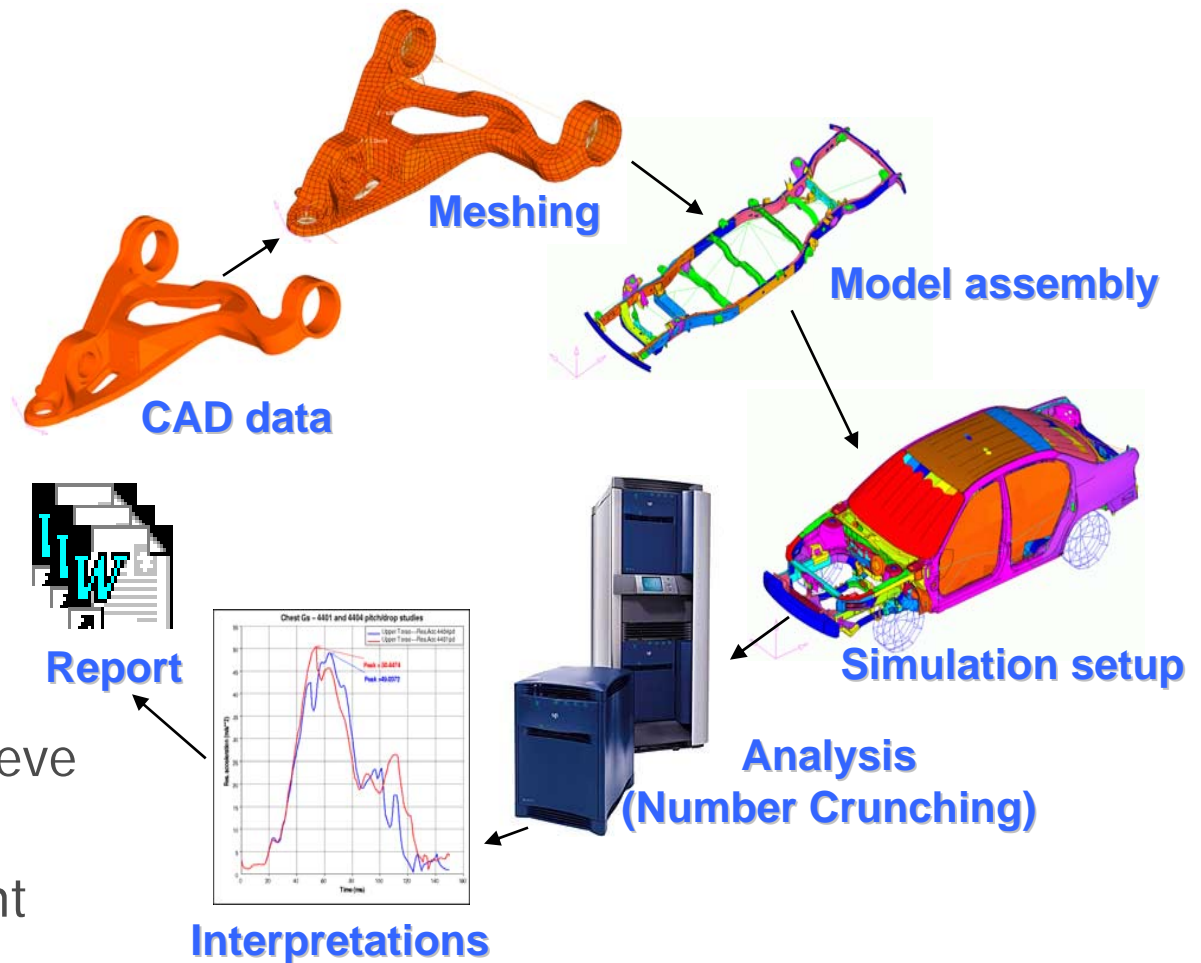
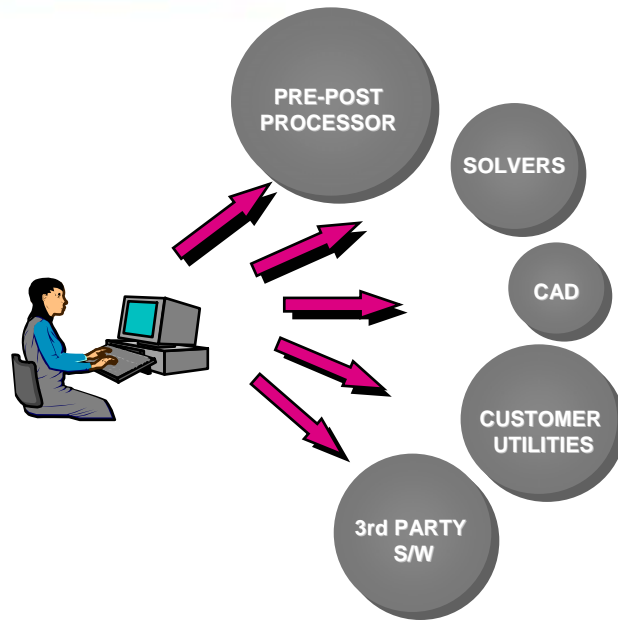
## The requirement

- ⦿ A unified framework for full simulation process execution and management
- ⦿ A single persistent data management system
- ⦿ A unified user interface to data/information

# Customer's heterogeneous CAE ecosystem

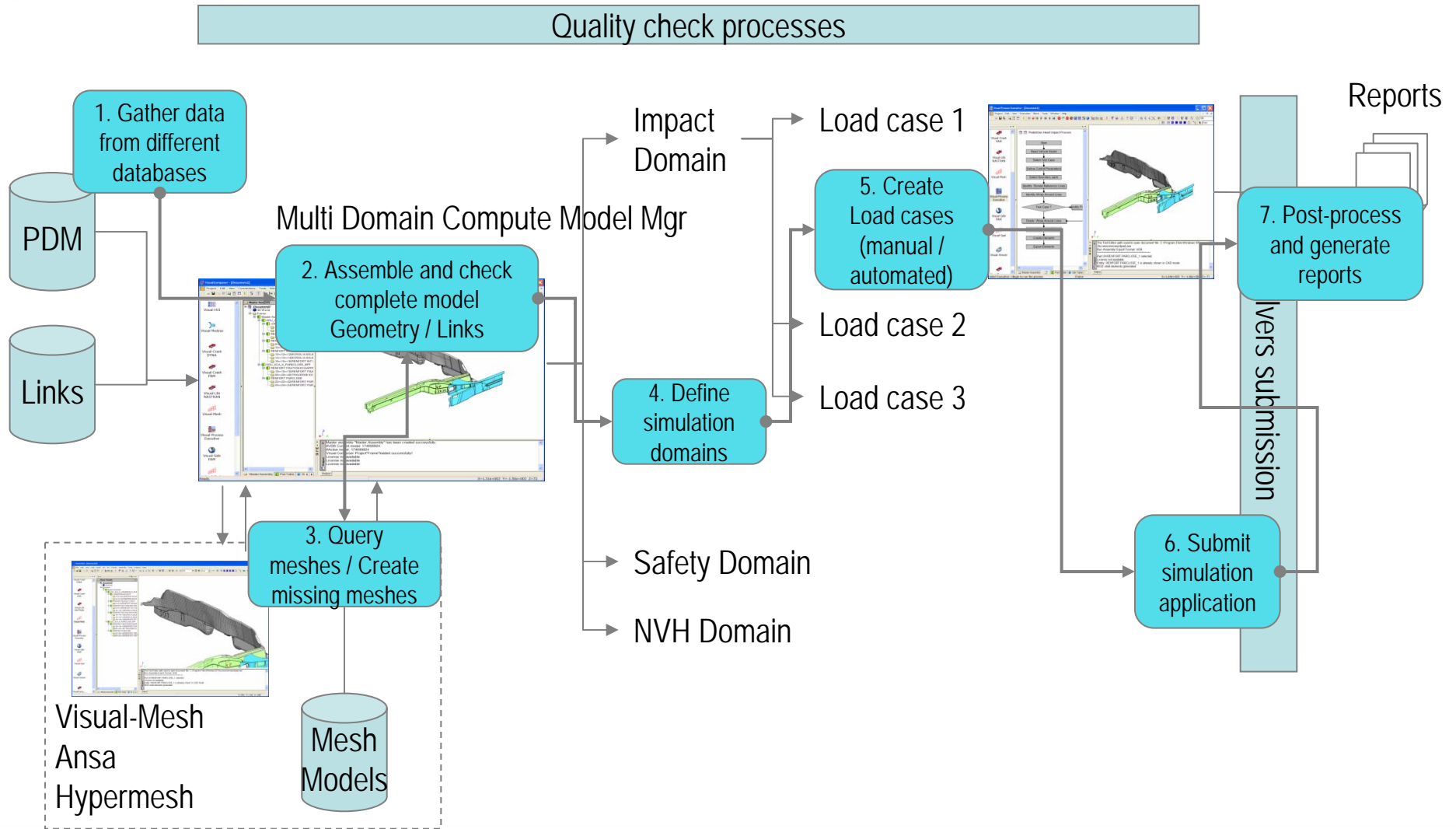


# Traditional CAE & Conventional Tools



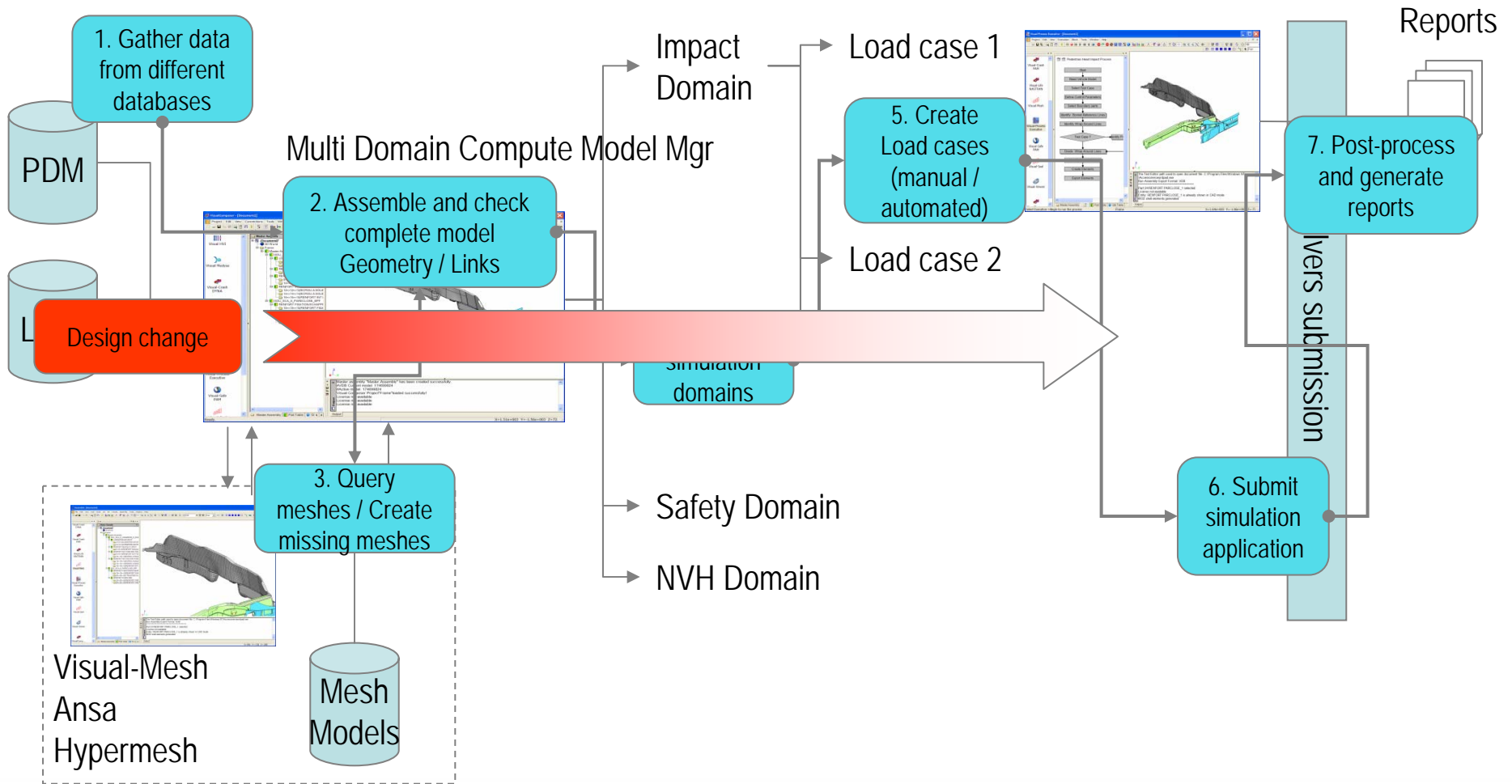
- Complex
- Force engineers to learn several applications to achieve a single design objective
- Extensive data management
- Training-intensive

# The Simulation Process



# Design change propagation

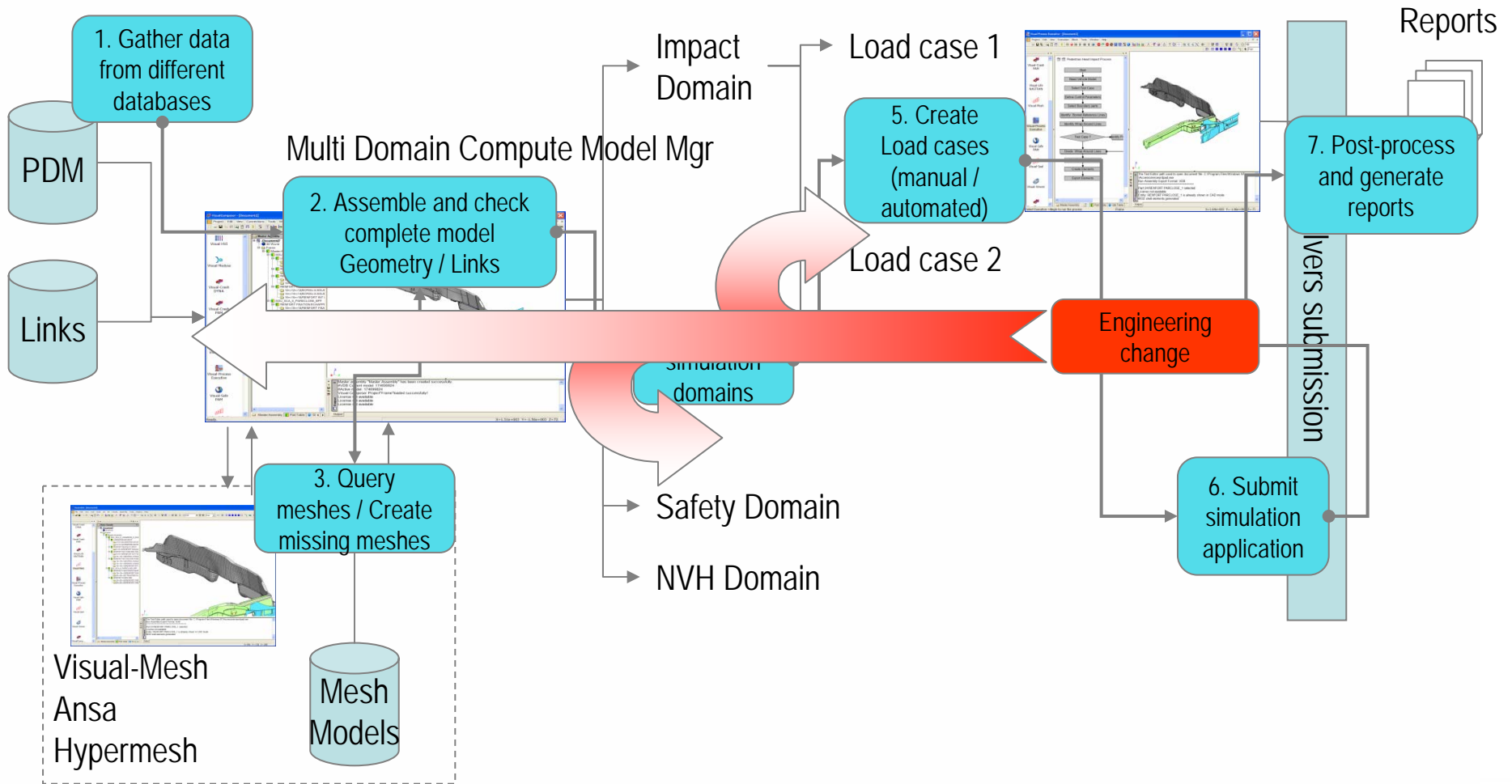
Quality check processes



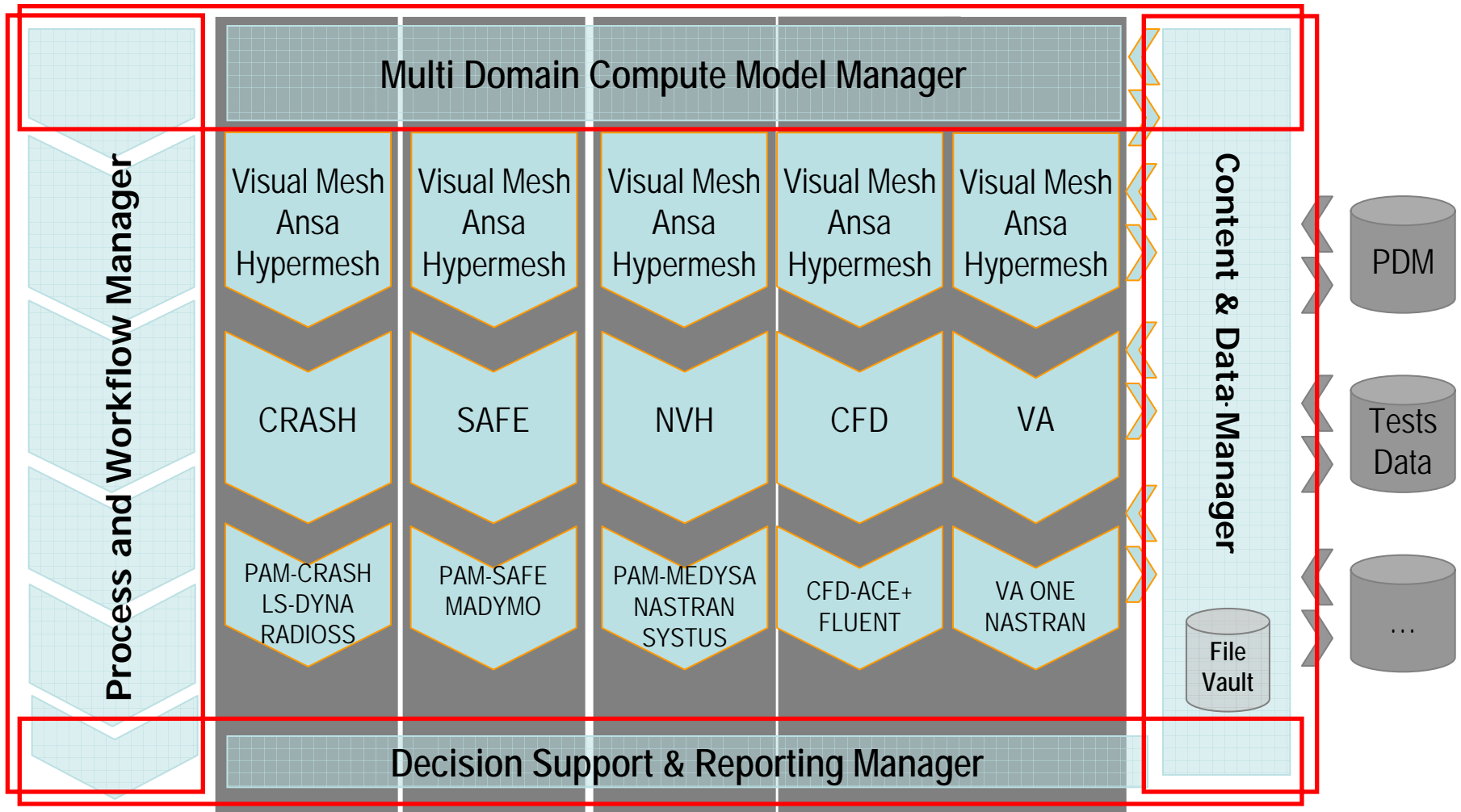


# Engineering change propagation

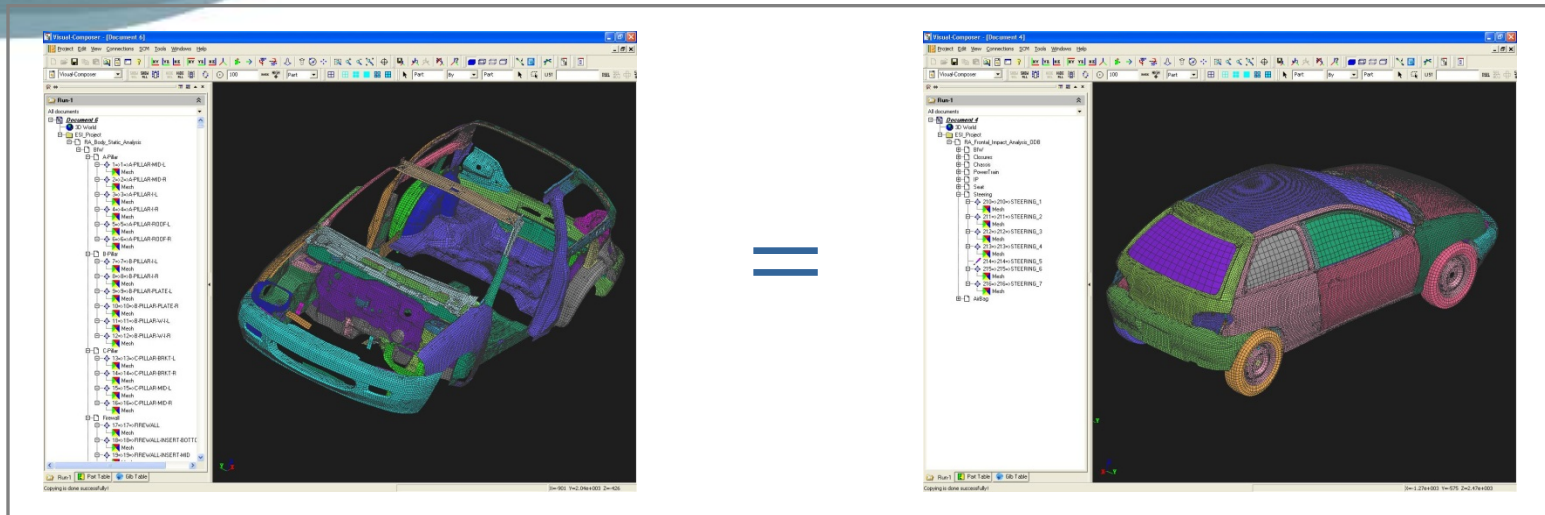
Quality check processes



# VisualDSS - The End-to-End Decision Support System for CAE



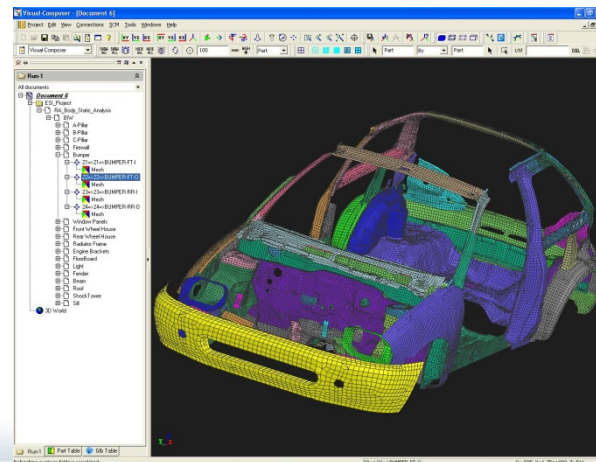
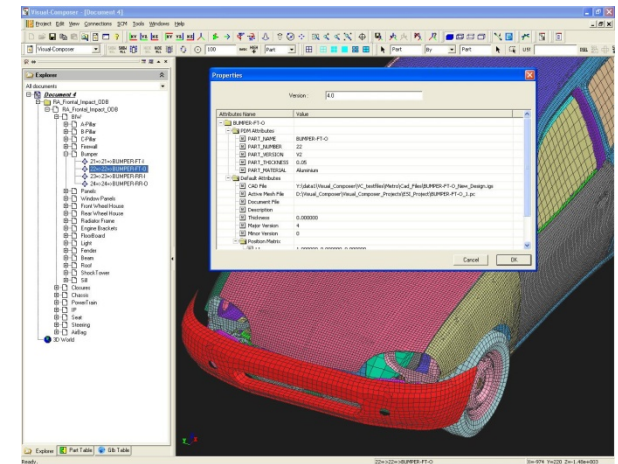
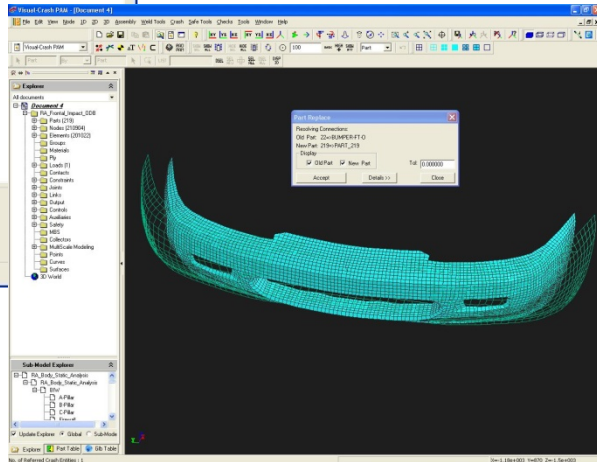
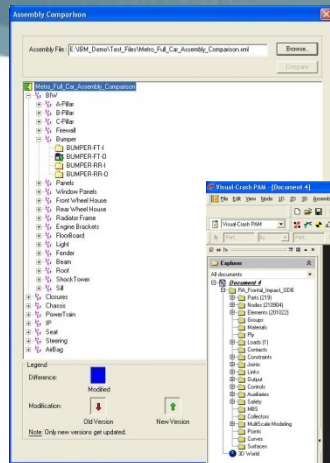
# Multi Domain Compute Model Manager



- Multi Domain Compute Model Manager allows to:
  - Build & manage simulation models for multi-domain usage
  - Keep data consistency between domains
  - Maintain the link to design data by comparing and updating the simulation model after design changes
  - Perform common operations between domains (for ex: connections integrity or initial penetrations checks)
  - Manage multiple mesh representations per part, allowing different domain users to share data

# Design change propagation

The change in the bumper design is propagated to the relevant input decks



# Multi Domain Compute Model Manager

The screenshot displays the ESI Multi Domain Compute Model Manager software interface. The sidebar on the left contains several modules, with 'Visual-Process Executive' highlighted by an orange box. The main window shows a 3D model of a car with various components highlighted in different colors. The Explorer tree on the left lists the following items:

- car
  - Parts (228)
  - Nodes (74414)
  - Elements (76769)
  - Groups (7)
  - Materials (219)
  - Ply
  - Loads (8)
  - Contacts (1)
  - Constraints (15)
  - Joints
  - Links
  - Output (1)
  - Controls (13)
  - Auxiliaries (52)
  - Safety
  - MBS
  - Collectors
  - MultiScale Modeling
  - Points
  - Curves
  - Surfaces

The bottom of the interface shows an output window with the following statistics:

|                         |     |
|-------------------------|-----|
| No. of MBS Rigid bodies | = 0 |
| No. of Mgrids           | = 0 |
| No. of Picks            | = 0 |
| No. of Look Ups         | = 0 |
| No. of Part Import      | = 0 |

File C:\Products\VE\data\Frontal-SideImpact\_Pam\car.pc loaded

Output

X=1.45e+003 Y=-2e+003 Z=745

Process & Workflow Manager is to overcome these issues

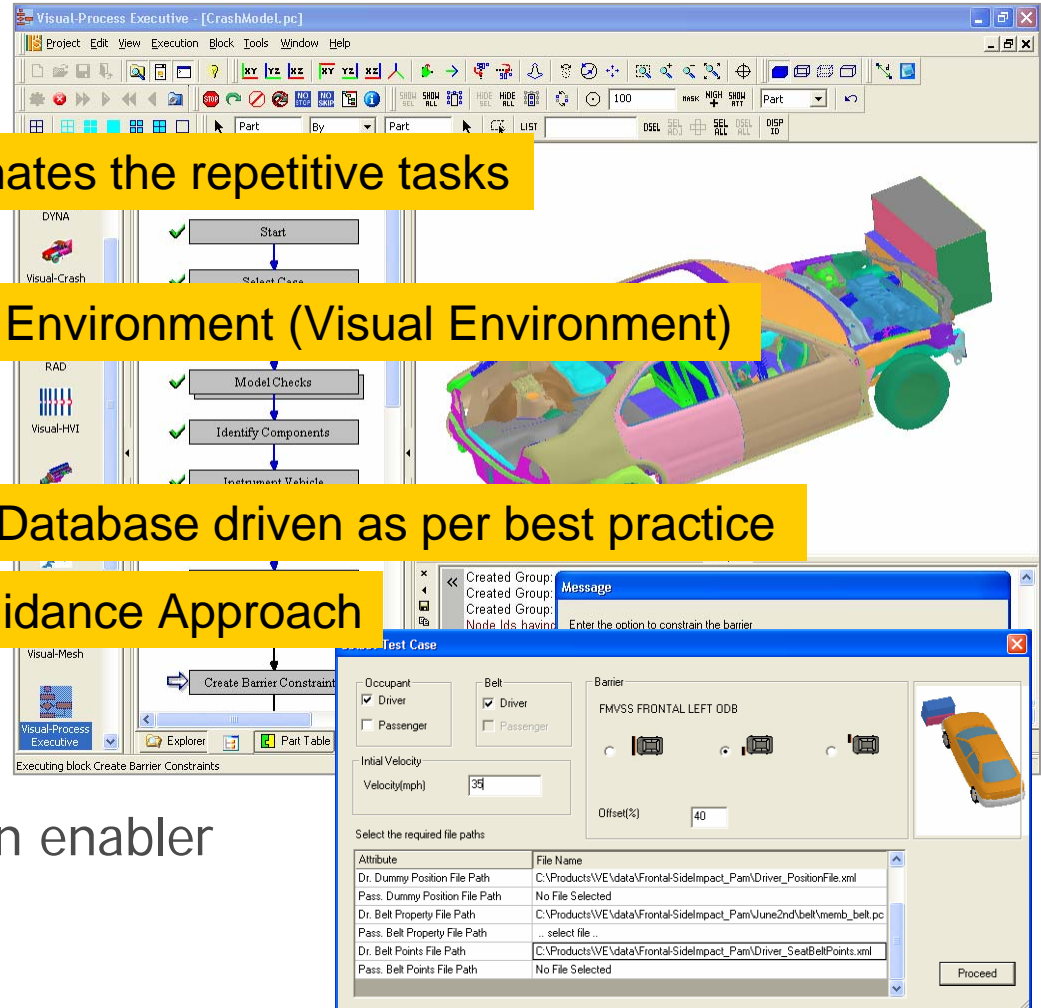
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**Simplifies and Automates the repetitive tasks**

**Single Environment (Visual Environment)**

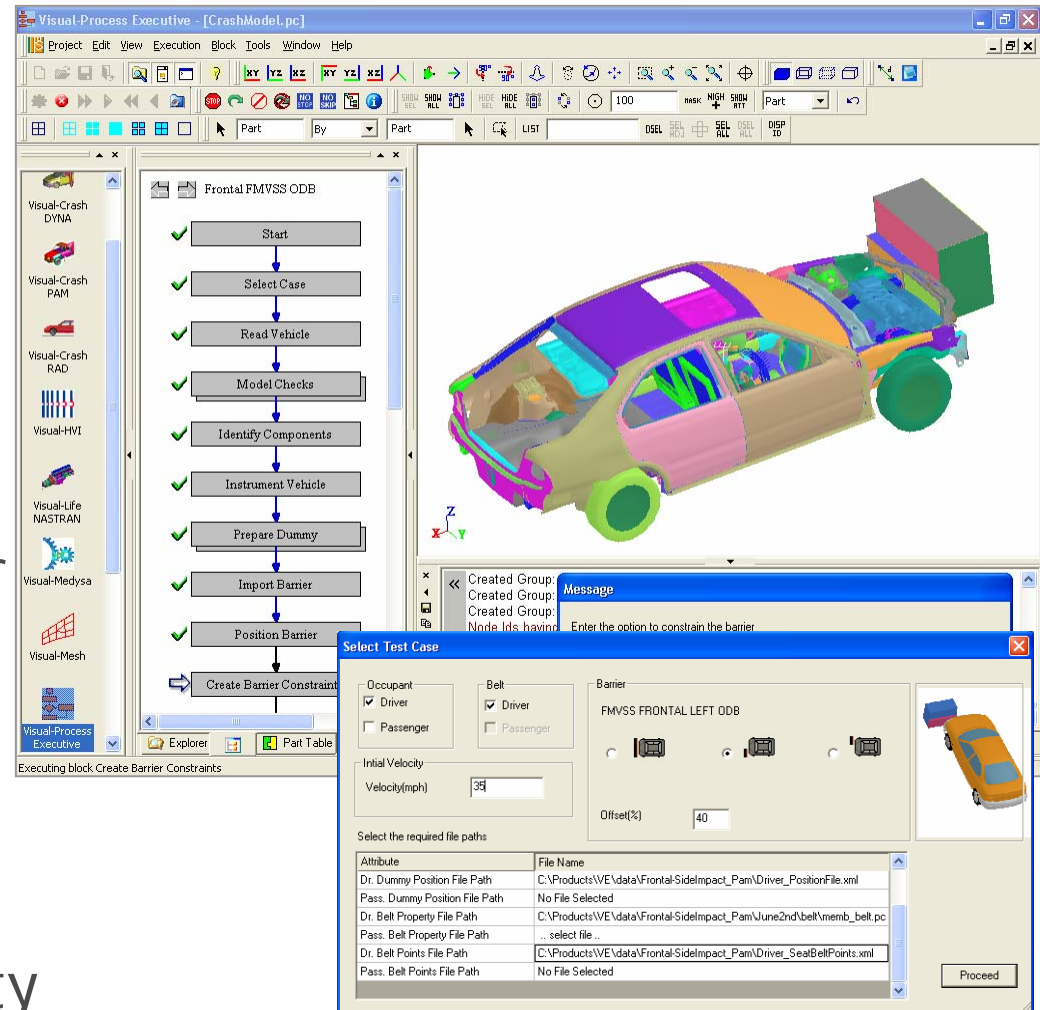
**Database driven as per best practice**

**Process Guidance Approach**



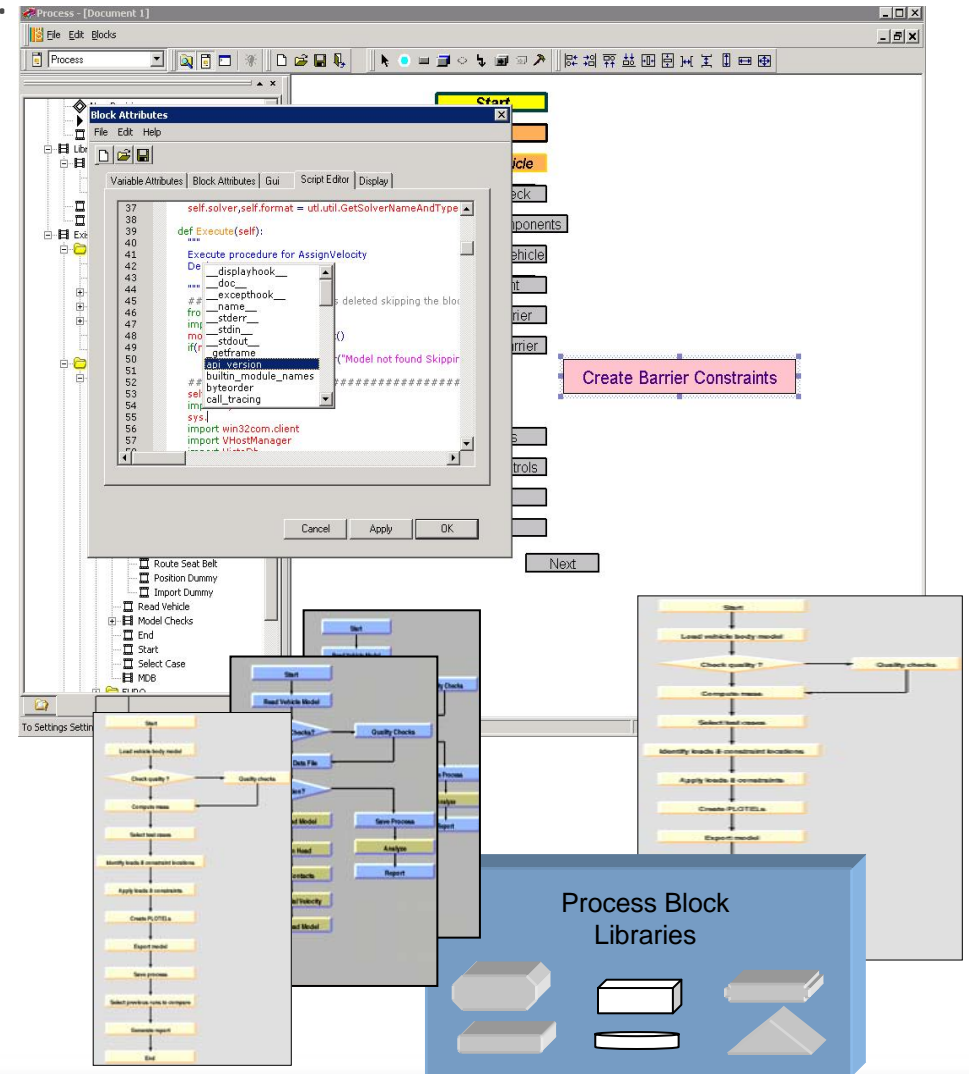
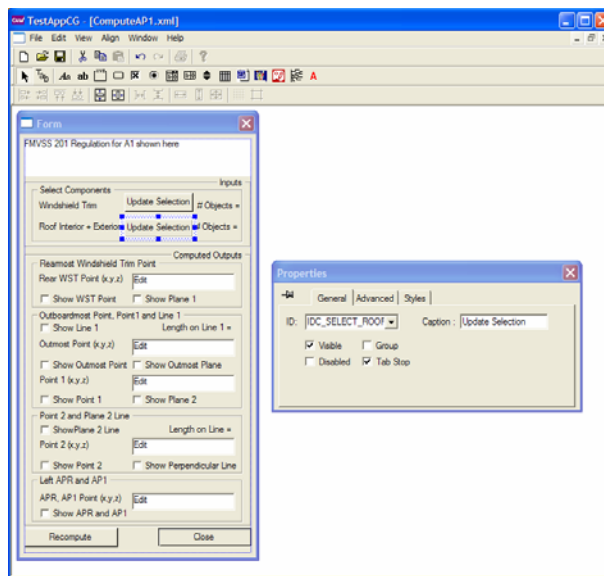
Process & Workflow Manager is an enabler of "Simulation Based Design"  
More simulations and iterations

- ⦿ Best practices and knowledge are captured to reuse
- ⦿ Time consuming, repetitive tasks and common processes are automated
- ⦿ Complex simulation processes are simplified for better understanding and improve efficiency
- ⦿ Available in user and enterprise environment
- ⦿ High increase in productivity

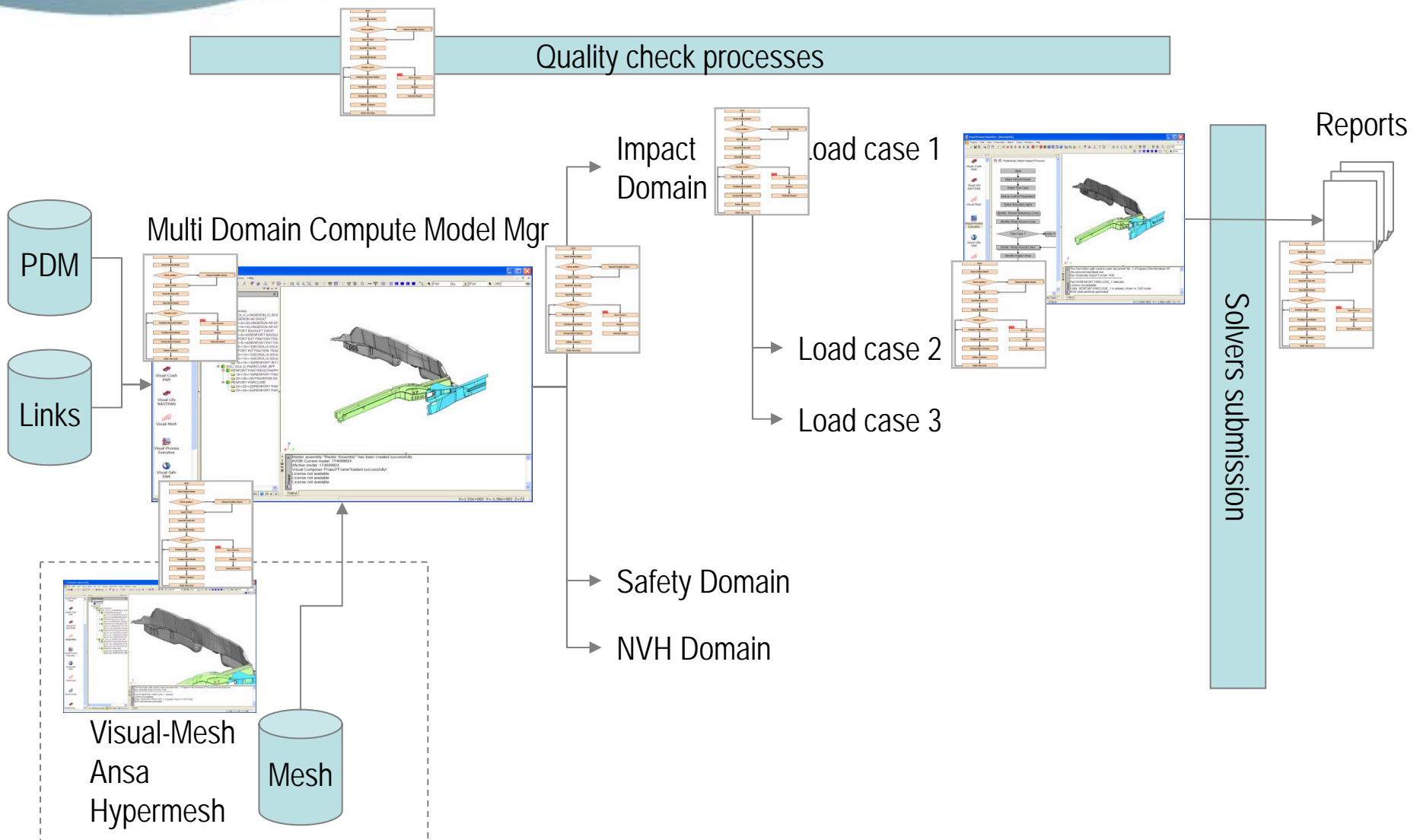


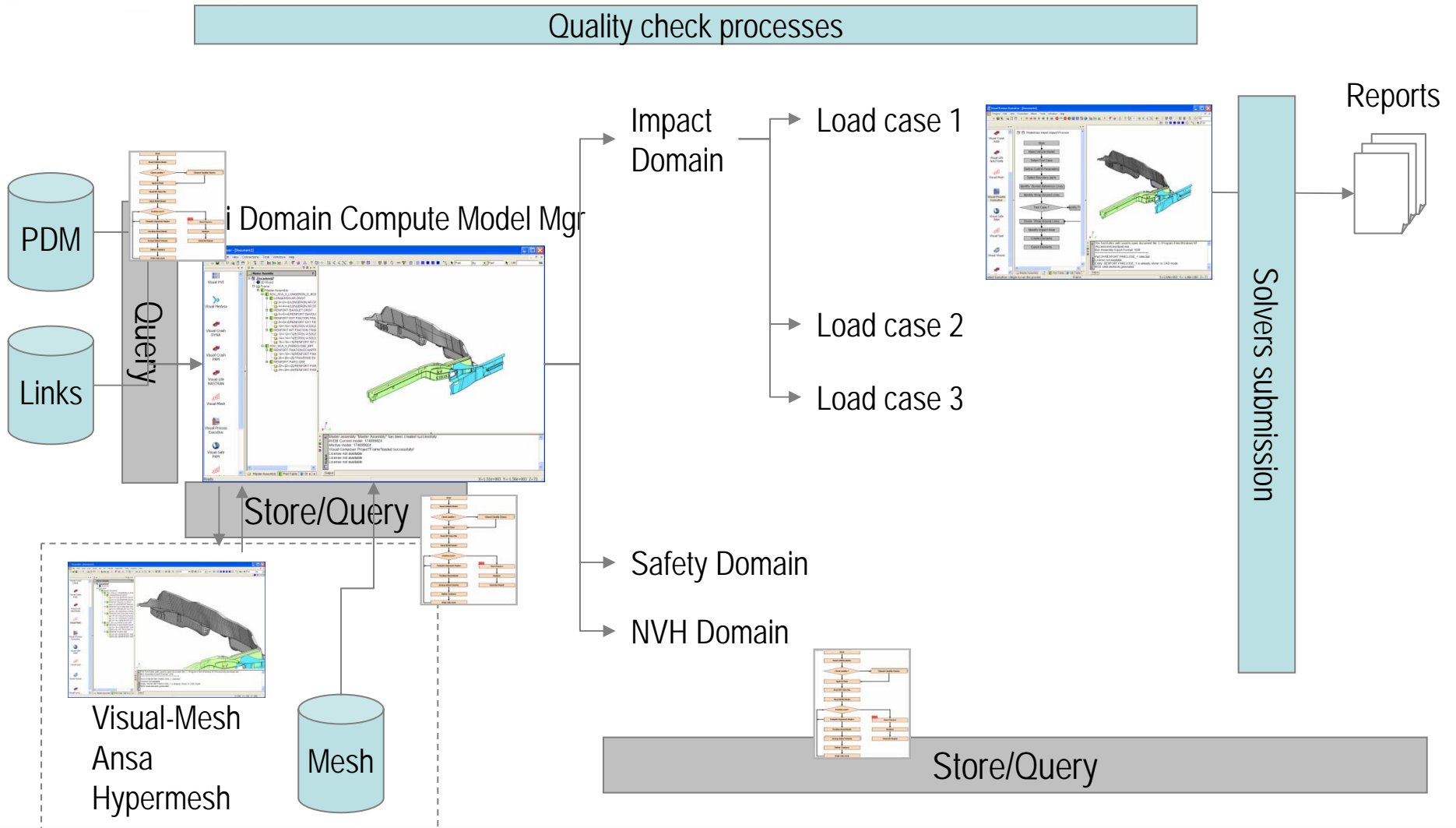
Process Builder – to build the process:

- 🕒 Open architecture
- 🕒 API's, CAE task libraries
- 🕒 Capture of Best Practice/Process for deployment Re-use
- 🕒 Create Workflow based on required functionality

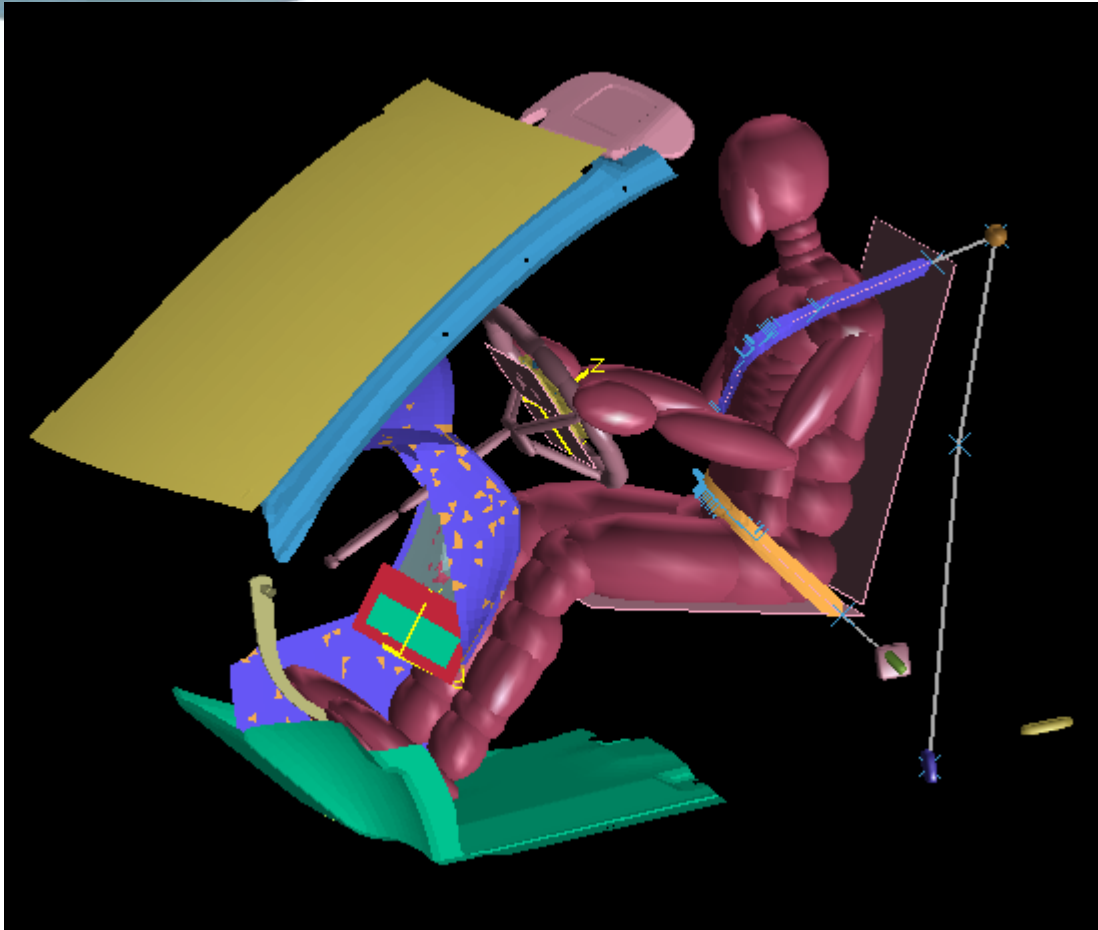








# Productivity Example



Completely  
automates  
Frontal NCAP  
model  
building

From 74 hours to < 1.5 hour  
Reliable and repeatable result

# Productivity Examples

## FMVSS 203, Seatbelt Modeling

Hyundai MOBIS Corp.  
Soon Gu Hong,

75 hours reduced to 8 hours

## FMVSS 201 Head Positioning

Visteon Corp.  
Ravi Thyarajan

3 hours reduced to 10 minutes

## Inertia Relief Analysis

General Motors  
Frank Chao

14 days reduced to 5 hours

## Body Mount Static Stiffness Process

General Motors  
Frank Chao

5 days reduced to 2 hours

## EPVS -Full body Static Stiffness Process

Ford Motor Company  
Jamie March

48 hours reduced to 2 hours

## IP-Knee Restraint Process

Ford Motor Company  
Juanito Co

8 hours reduced to 5 minutes

## Sled DV Process

Ford Motor Company  
Ben Ren Tang

2 days reduced to 10 minutes

## Frontal NCAP

Daimler Chrysler  
Dan Dooge

74 hours reduced to 1.5 hours

## Productivity Benefits:

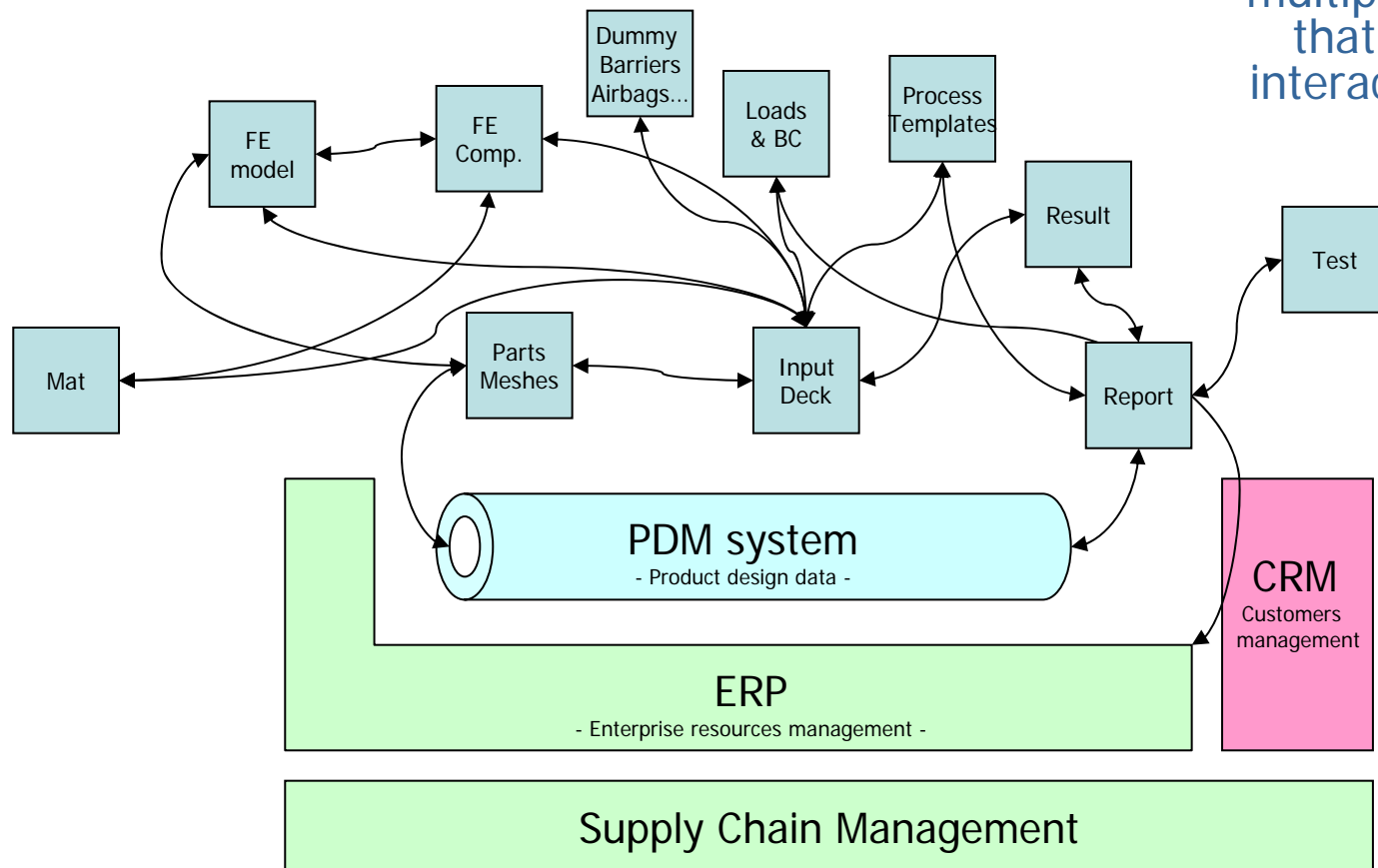
- ⦿ Shortens **time** per design iteration
- ⦿ Reduces drudgery, **inconsistencies**, and **errors**
- ⦿ Streamlines **data** management
- ⦿ Frees CAE experts to add **engineering** value
- ⦿ Provides **intuitive** environment for fast ramp up of new users and non-specialists

## Enterprise Benefits:

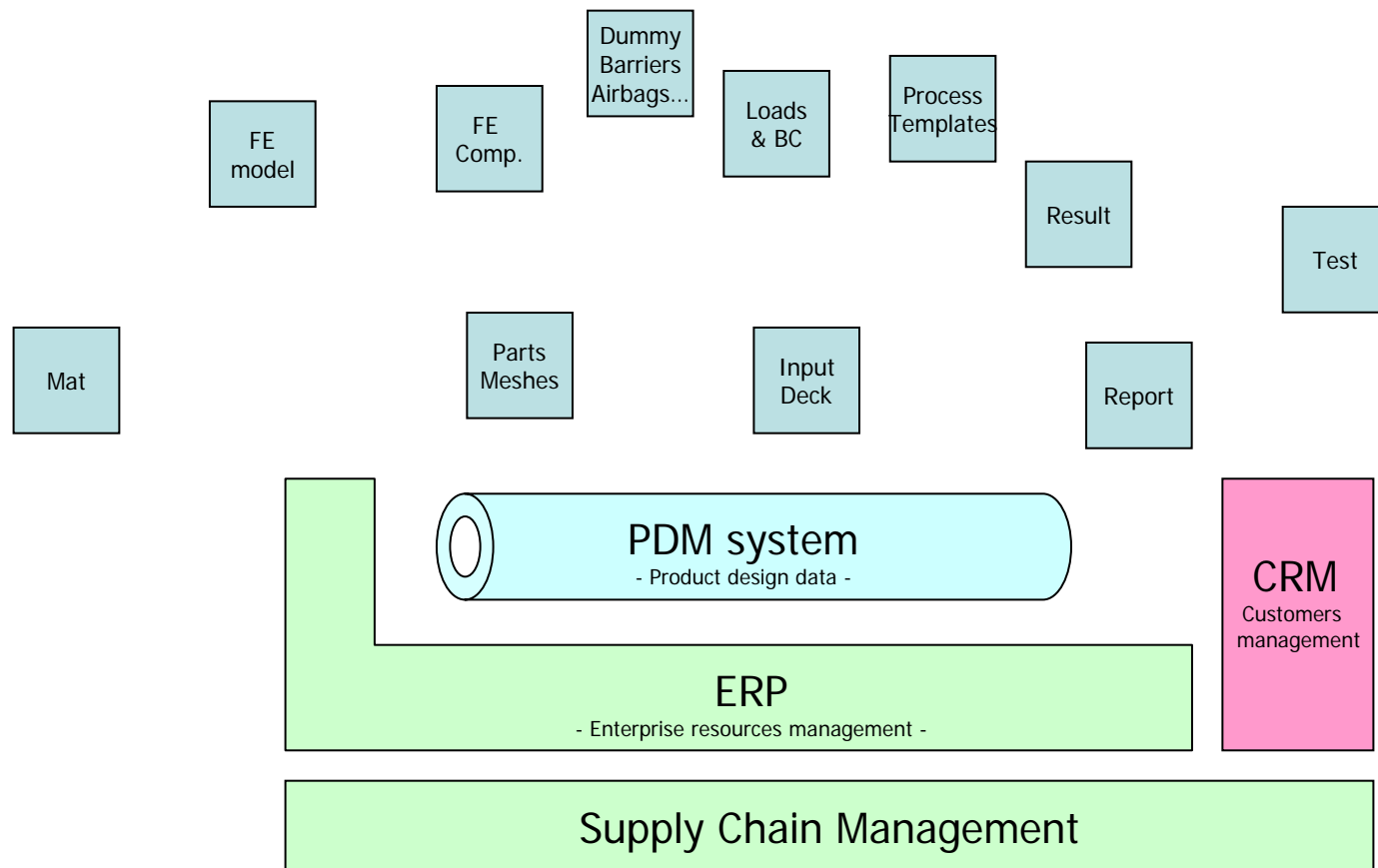
- ⦿ Captures **best practices** and enables enterprise-wide standardization
- ⦿ **Institutionalizes** processes, reduces training time
- ⦿ Enables **resource** mobility
- ⦿ Enables **integration** and **re-usability** of enterprise-specific tools

# Simulation data as a part of the global enterprise data

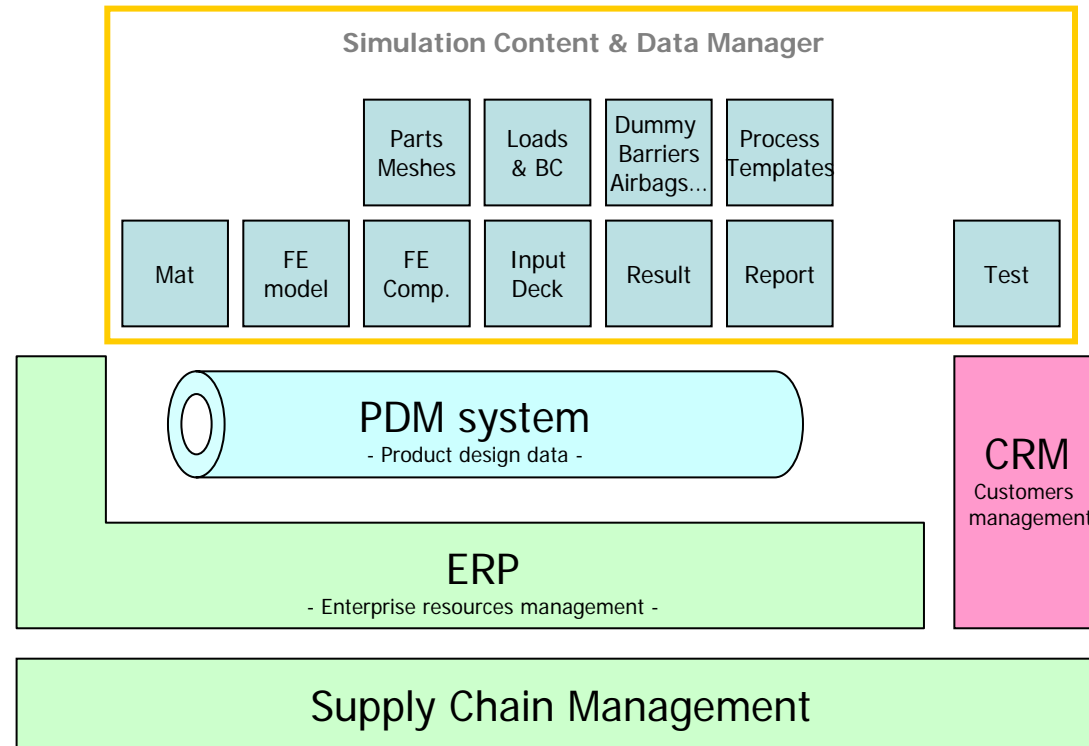
A lot of different data types in multiple domains that strongly interact together



# Simulation data as a part of the global enterprise data

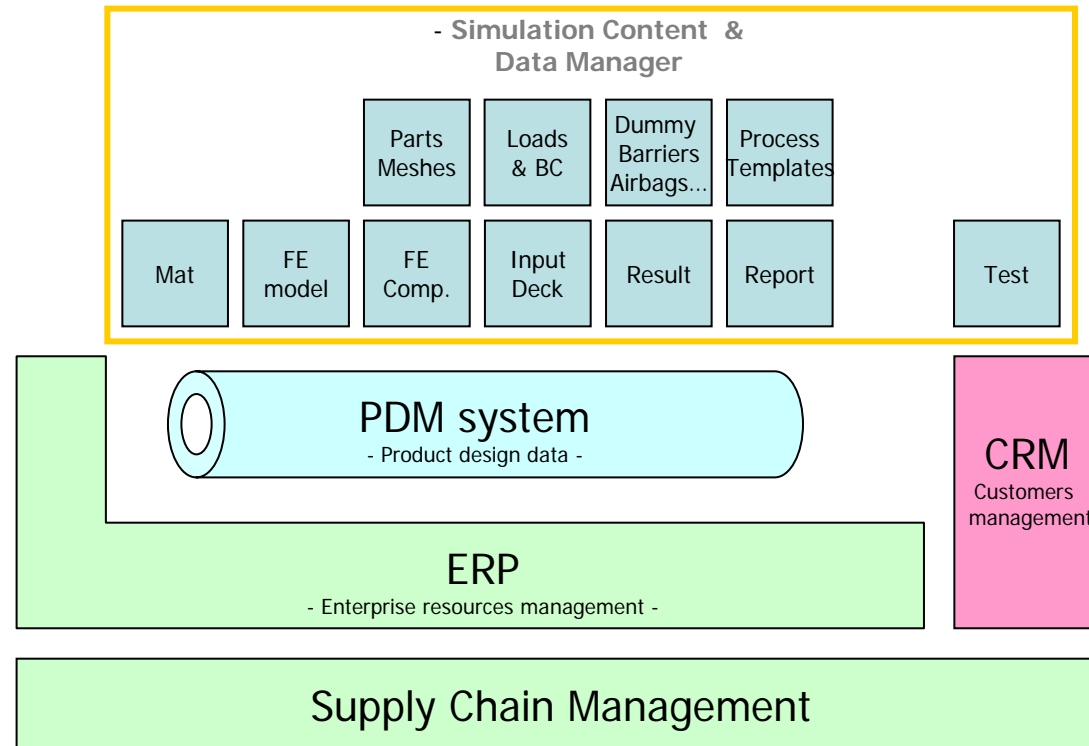


# Simulation data as a part of the global enterprise data

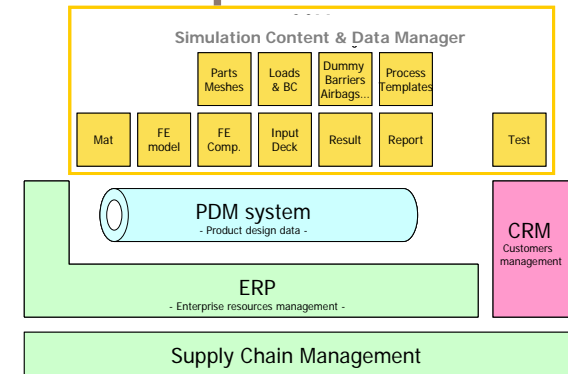




# Simulation data as a part of the global enterprise data



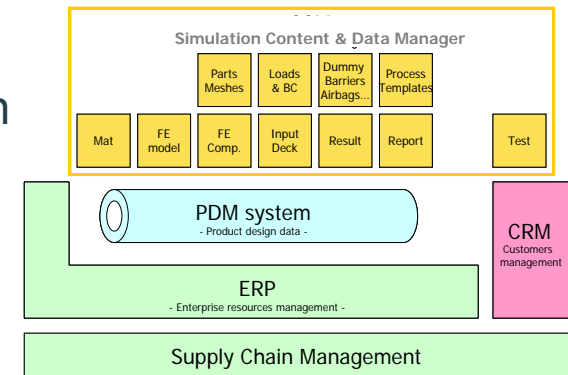
# Simulation data as a part of the global enterprise data



- Management of all simulation data
  - End to end simulation process
  - Multi-domain database
- Integration into the global enterprise data schema
  - Link to legacy simulation data management systems
  - Link to relevant external systems (PDM, ERP, etc.)
- Integration into the extended engineering collaborative environment
  - Secured accesses to authorized users
  - Traceability of data modifications
  - Virtualization of databases for the extended enterprise

# Use cases examples

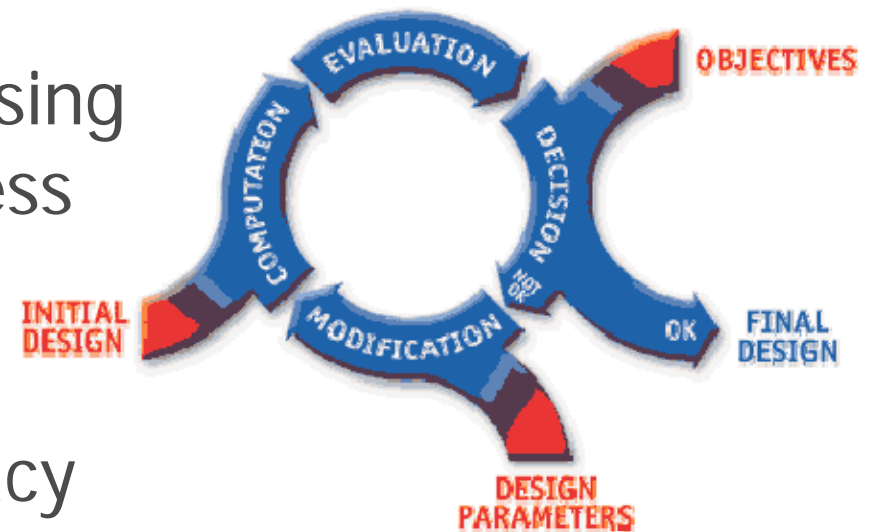
- Data sharing between engineering teams
  - NVH, Impact and Safety teams to use same design data at the same time
  - Teams to share engineering data, and ensure impact of modifications proposals
- Traceability of changes
  - All changes to be identified (user, rationale), traced and kept along the design process
- Access security according to user privileges
  - Some users to be granted specific privileges for restrictive or enhanced access
- Collaborative engineering between internal teams, or with suppliers' teams
- Centralized access to legacy or in-house databases
  - Material databases
  - Test databases
  - Design databases, etc.



Ready for  
  
 Speciality

# Decision Support & Reporting Manager

- A Dash board to Automate, Organize, Manage, Process, Analyze, Optimize and Visualize large data set using business logic and business intelligence
- Helps manage corporate knowledge base and legacy design Data
- Multiple Decision Model Support for What-if analysis



# Decision Support & Reporting Manager

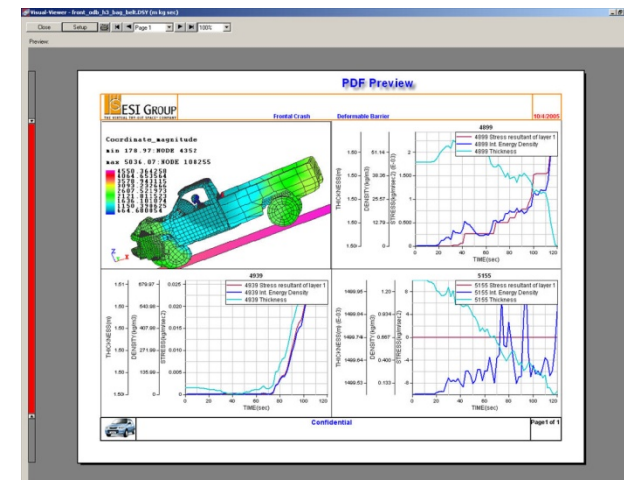
## ⦿ Automated report generation

⦿ Html, PowerPoint, PDF

⦿ Create reports for each domain with standard content

⦿ Automatically create reports which compare different variants of different projects

⦿ Basic building block for knowledge database



## A robust Engineering solution... in a robust IT framework

- Visual *DSS* reflects the robustness of the engineering solution
- Visual *DSS* enables the integration into an enterprise IT framework through :
  - Proven technology
  - Usage of Corporate IT backbone
  - Flexible architecture

## Visual*DSS* based on proven technology

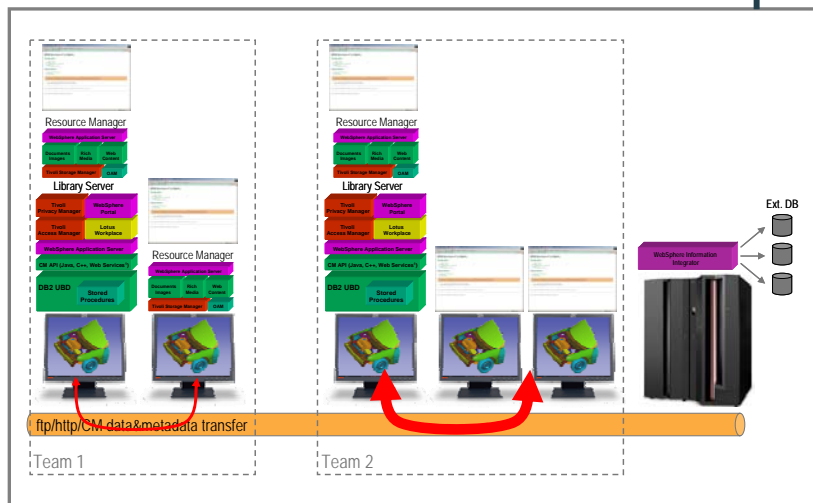
- Visual*DSS* is based upon IBM DB2 Content Manager
  - Proven and secured database system
  - Large installed base in the world
  - Customization and installation skills are found around the globe
  - Close cooperation between ESI Group and IBM
- Takes advantage of IBM middleware for:
  - Connectivity to legacy systems
  - Data administration (replication, mirroring, etc.)
  - Access and Security features
  - Virtualization of databases

# Integration into enterprise data and organization

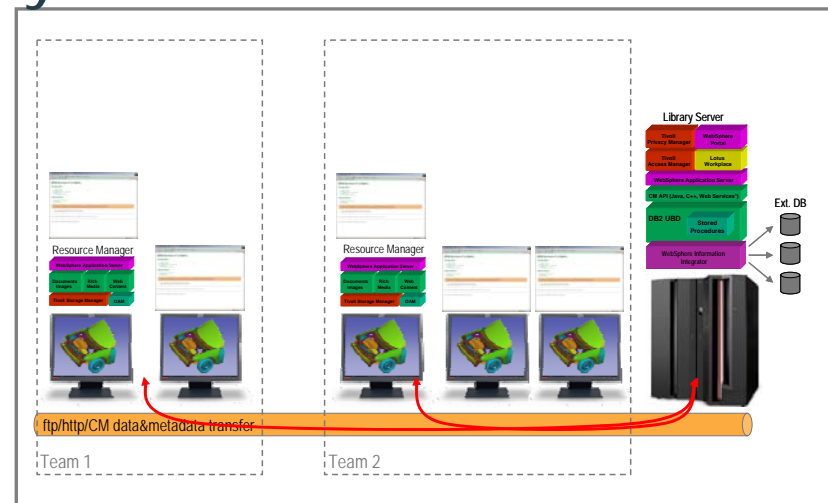
- Simulation practices
  - Data schema is customizable according to customer practices
  - Simulation data access can be automated within Process templates
- Integration into the existing IT environment
  - Link to PDM / ERP
  - Link to material database
  - Link to legacy repositories
  - Direct use of the LDAP corporate directory for robust and consistent user identification
  - And more...



- ⦿ Implementation of VisualDSS is flexible and may depend on :
  - ⦿ Internal organization, teams needs and locations
  - ⦿ IT policy
  - ⦿ IT architecture
  - ⦿ Network or servers capacity

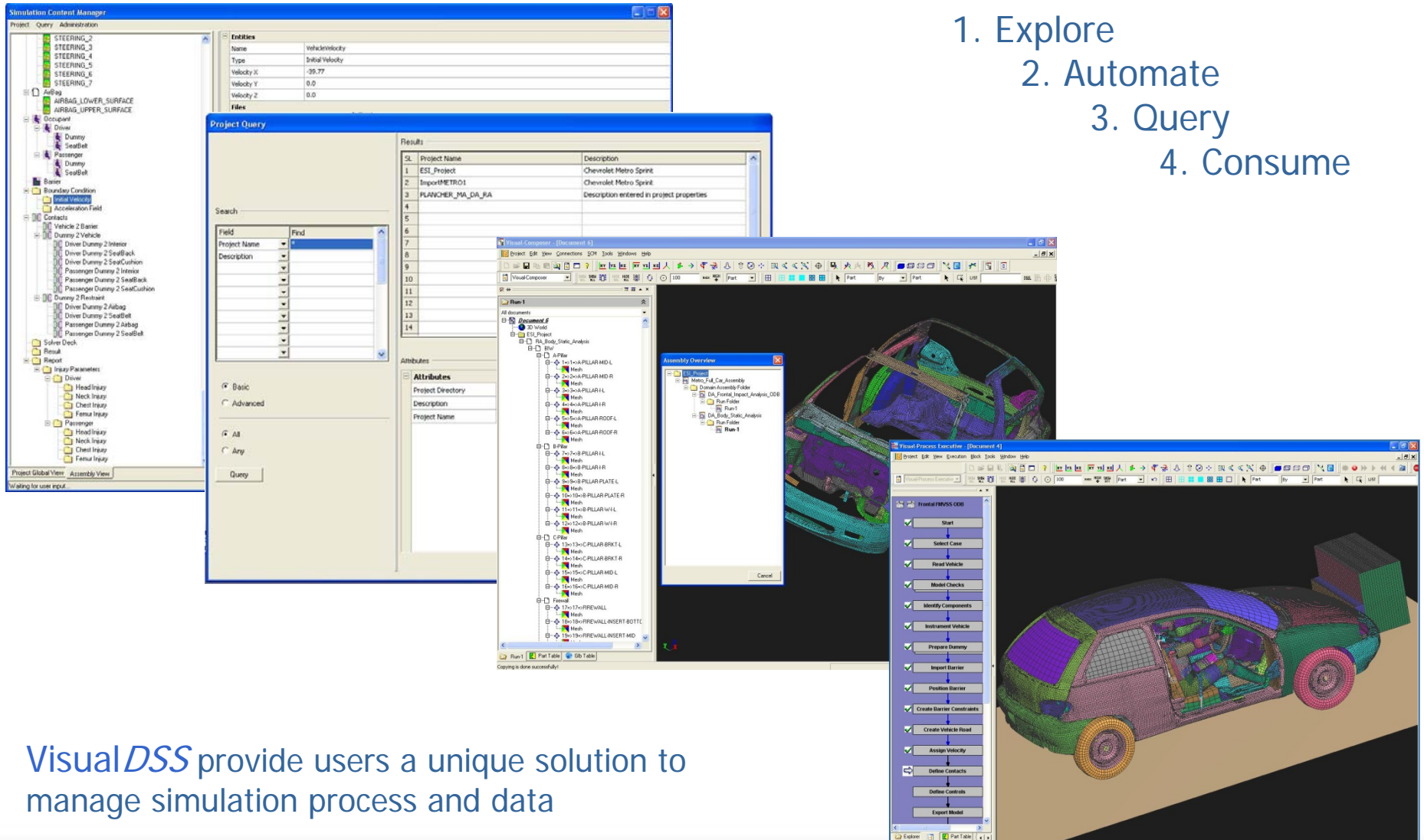


*Implementation examples*



# VisualDSS - a complete solution

1. Explore
2. Automate
3. Query
4. Consume



Simulation Content Manager

Entities

| Name            | Type             | Velocity |
|-----------------|------------------|----------|
| VehicleVelocity | Initial Velocity |          |
| Velocity X      |                  | -39.77   |
| Velocity Y      |                  | 0.0      |
| Velocity Z      |                  | 0.0      |

Project Query

| SL | Project Name      | Description                               |
|----|-------------------|---|
| 1  | ESI_Project       | Chevrolet Metro Sprint                    |
| 2  | ImportMETRO1      | Chevrolet Metro Sprint                    |
| 3  | PLANCHER_MA_DA_RA | Description entered in project properties |

Visual Composer - [Document 6]

Visual Process Executive - [Document 6]

VisualDSS provide users a unique solution to manage simulation process and data

## VisualDSS

- is a unique “End-to-End” decision support system solution for CAE across domains and organizations
- interactive applications enables organizing, tracing, and sharing data within the extended enterprise
- integrates into our customers’ environment through the use of open and proven best practice technologies
- is open architecture and can be integrated with any application

# THANK YOU

