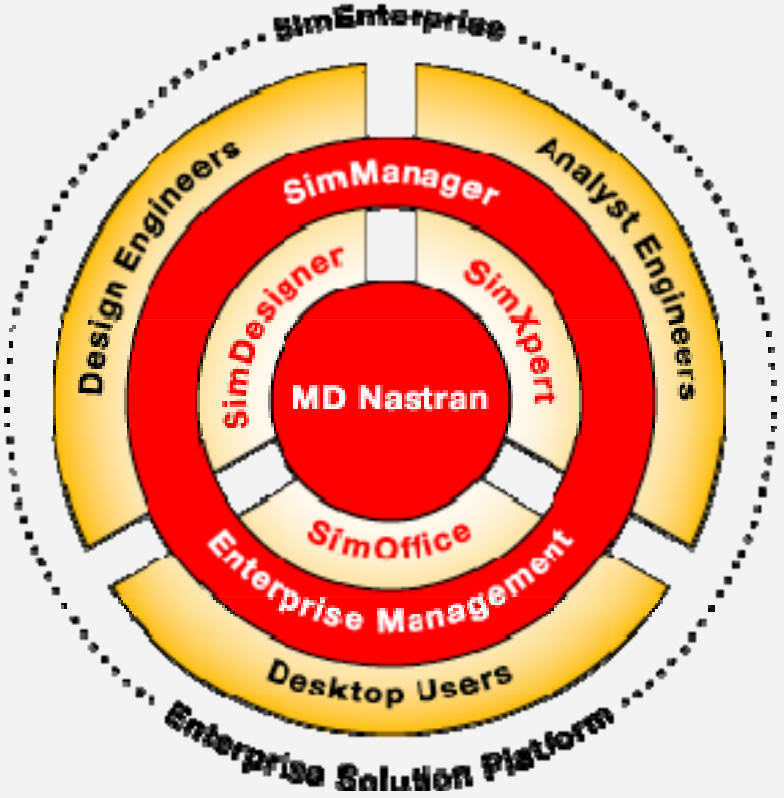
# Enterprise Simulation Management and MSC SimManager™

May 2007

# Agenda

- **Business & Engineering Motivation**
- **Enterprise Simulation Management**
- **SimManager Overview**
- **Value:  Case Studies**
- **Q & A**



# What is Simulation?

**Math-based methods for representing and evaluating performance of mechanical, electrical, electronic, biological, chemical, etc. systems/sub-systems/components**

- **Tools:** Model authoring, solve, visualization, evaluation, etc.
- **Methods:** Math models, FE, CFD, Finite difference, system schematic, etc. etc.
- **Data:** Input data objects (environmental, material, descriptive, form, ...); Model data objects (decks, databases, parameter sets, ...); Result data objects (databases, txt, values, images, graphical, statistical ...)
- Meta-data: Data about all of the data (hugely rich and complex)
- **Processes:** Define/Collect/Pre-process/Solve/Post-process/Evaluate/Report; hugely varied at detail levels

# **Motivation:** Why manage simulation?

**Reduce engineering costs**

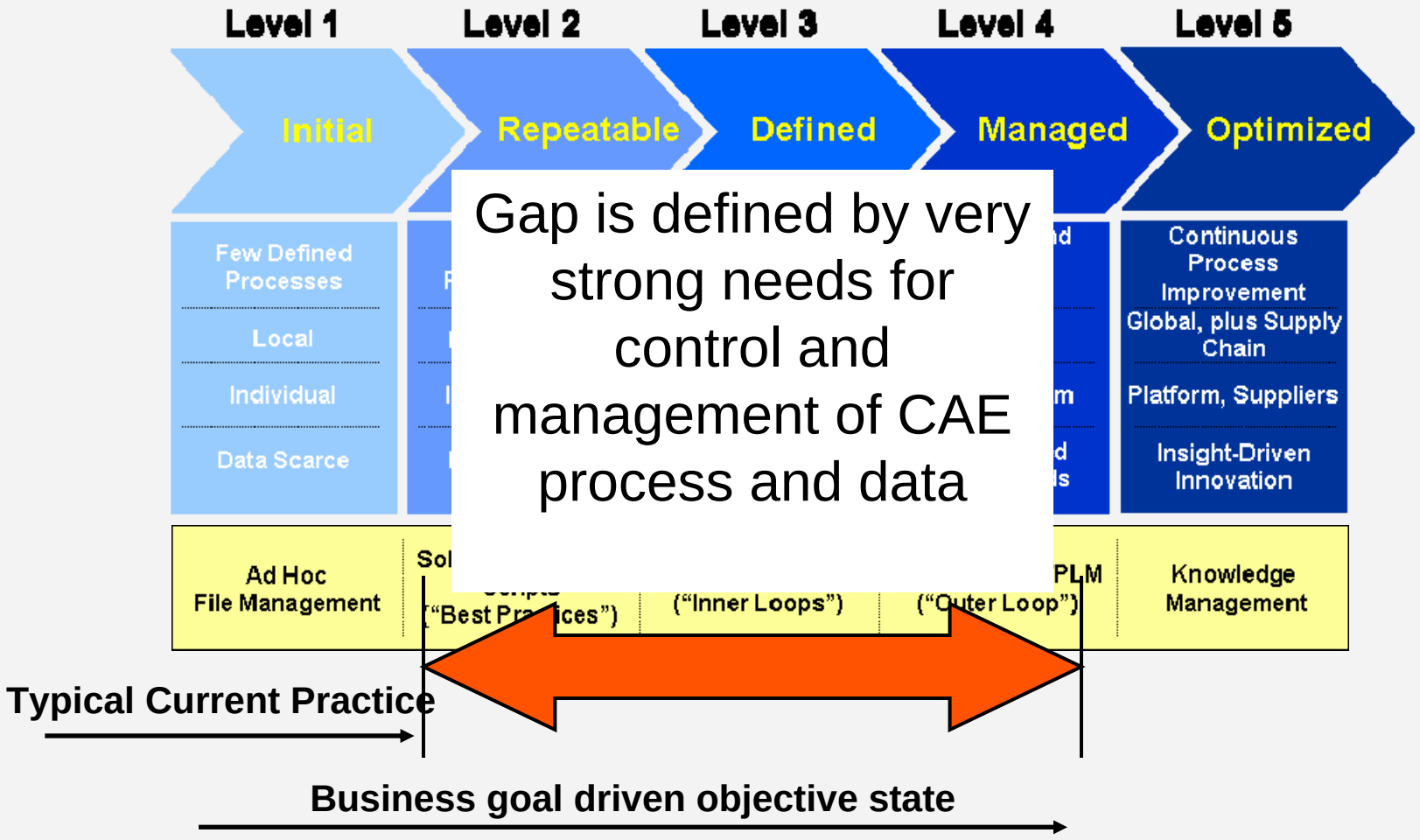
- **Manage quality**
- **Eliminate wasted time spent looking for information**
- **Enable reuse**
  - Don’t do the same thing more than once
  - Modify existing models rather than build from scratch

**Accelerate and enable innovation**

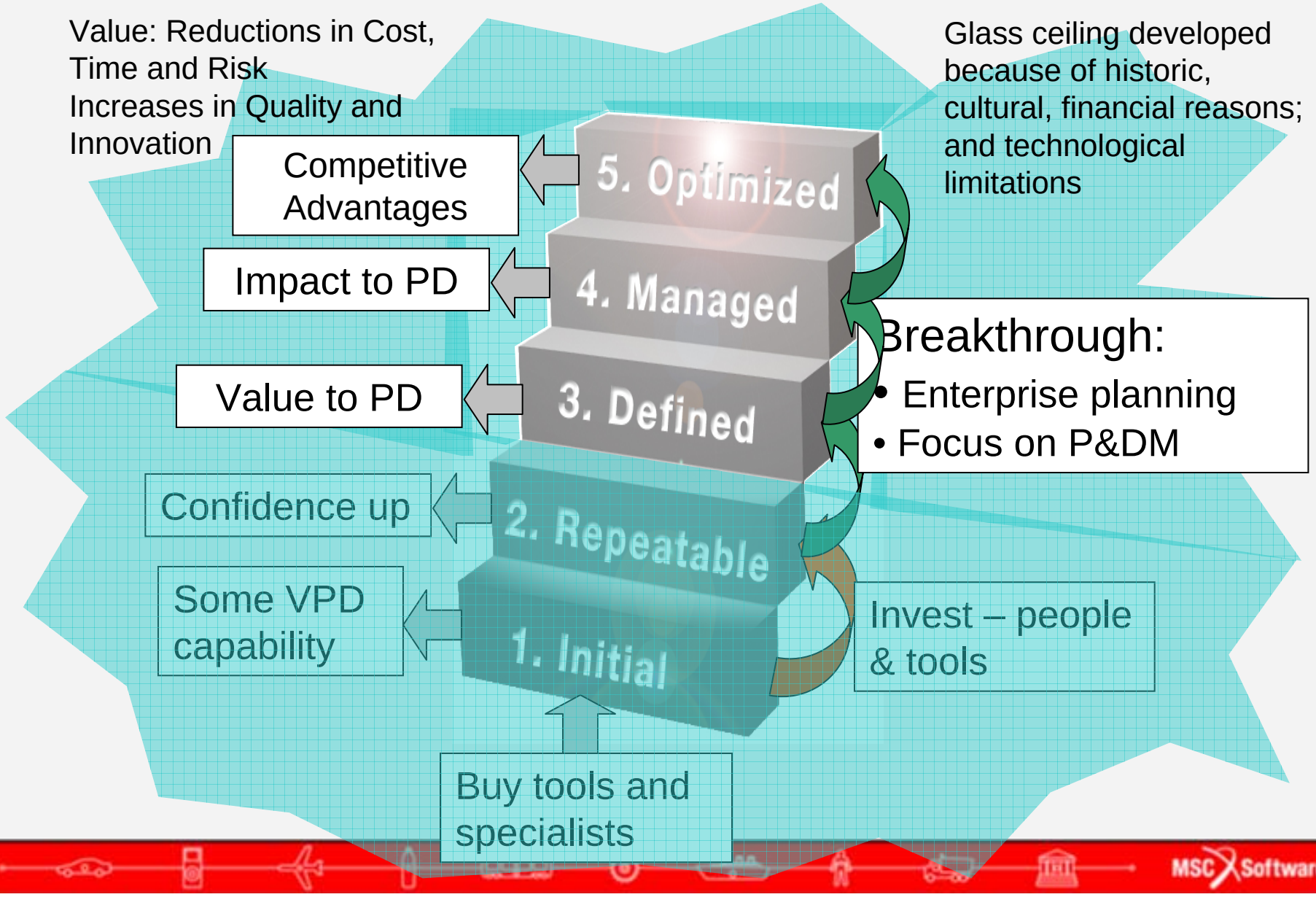
- **Accelerate functional assessment of products**
  - Reduce product development time
  - Allow more time for “what if” studies
  - Enable more thorough understanding of performance

- **Enable Continuous process improvement**
  - Test/CAE correlation

# Motivation: ...because it serves business goals

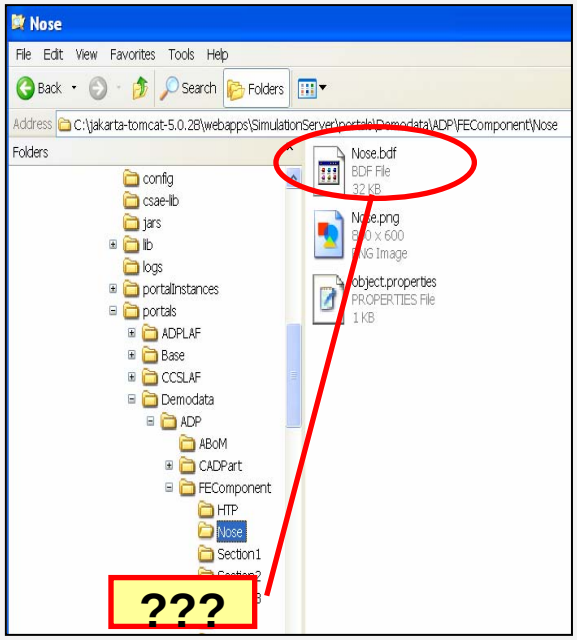


# Background: The VPD Glass Ceiling



# Managing simulation data is necessary…

- **Stored and Organized (folders)**
- **Protected (read-only)**
- **Available for collaboration (shared drive)**




…but not sufficient

- **Can't reuse what we don't understand**
- **Can't make decisions based on unknown quality**
- **Can't improve an uncontrolled activity**

# Data requires context to be valuable

| Enterprise App / Context | Enterprise Resource Planning (ERP) | Customer Relationship Management (CRM) | Product Data Management* (PDM) | Simulation Management |
|---|---|---|---|---|
| **Data to be Managed** | Business Transactions | Sales Opportunities | CAD Files<br>Bill Of Material | **Models**<br>**Results** |
| **Relevant Information Structure** | Resource Records | Customer Records | Product Configuration | **Product Configuration, Performance Metrics, Disciplines** |
| **Business Logic** | Work Instructions, Factory Logistics | Sales Process (prospect, propose, close) | Design & Release | **Methods and Processes** |

*Typically renamed Product Lifecycle Management (PLM)

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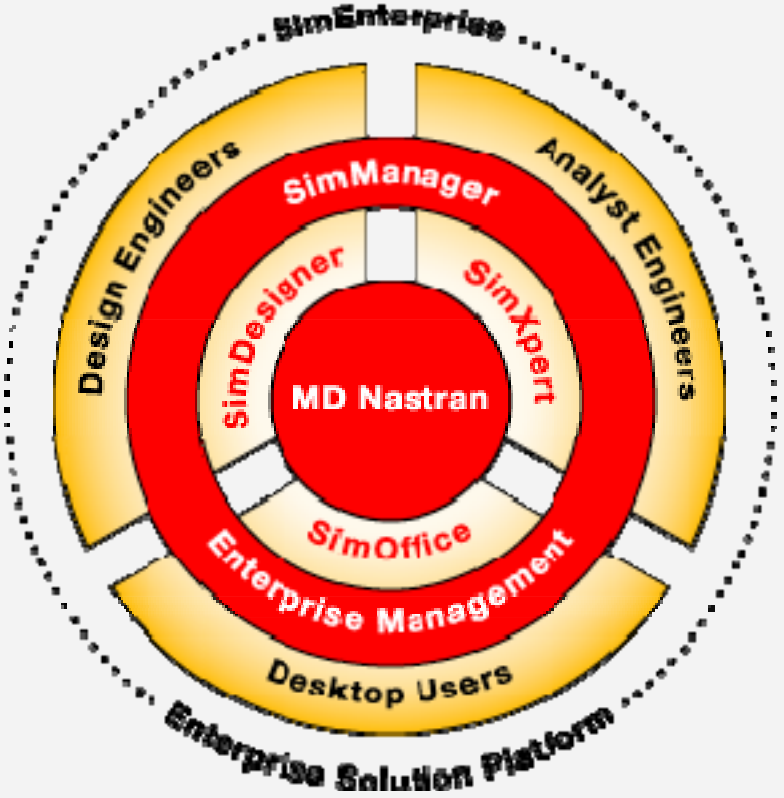


# **Objective:** Manage All Simulation

MSC SimEnterprise™

## Simulation Information

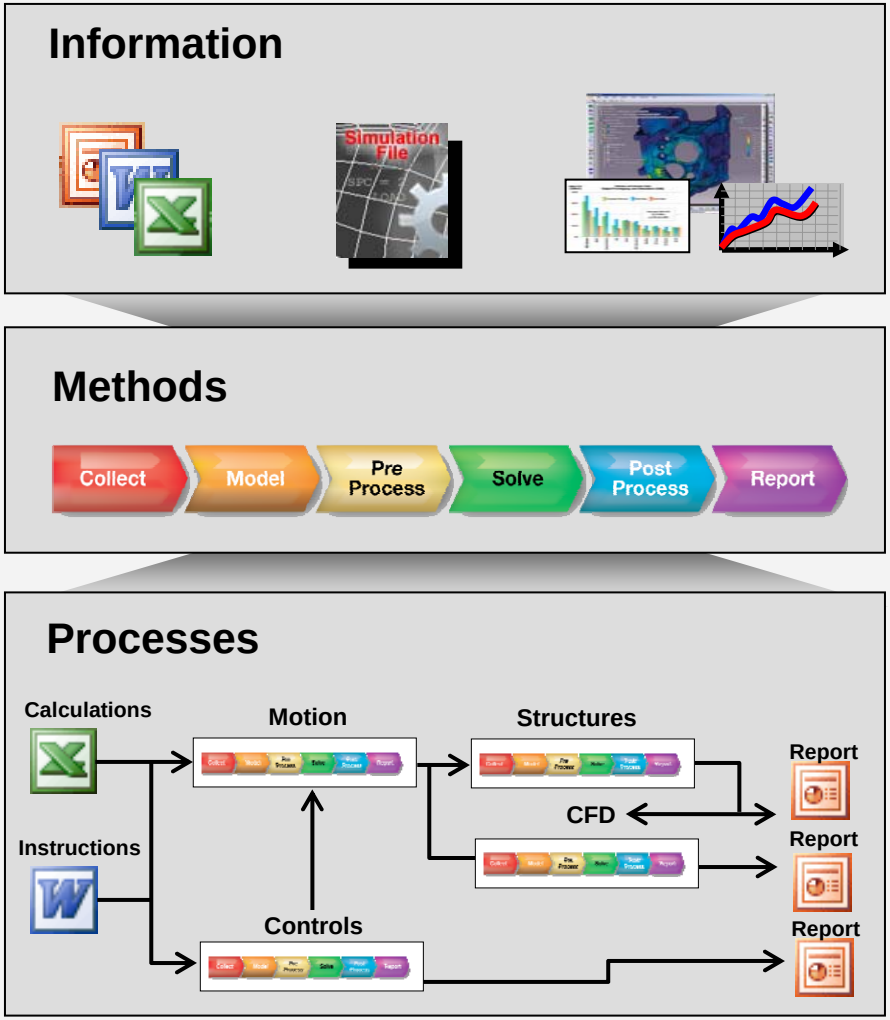
- Models
- Files
- Inputs and Outputs
- Association of information with specific methods and processes

## Simulation Methods

- Detailed tasks required to perform a simulation
- Preprocessing, Solving, Postprocessing

## Simulation Processes

- Multiple Methods
- Business logic that integrates simulation into engineering workflow



# **Objective:** Manage Methods & Processes

MSC SimEnterprise™

## Create Methods & Processes

- Graphical simulation Template Builder
- Combine SimTemplates
- Integrate in-house and 3rd party applications

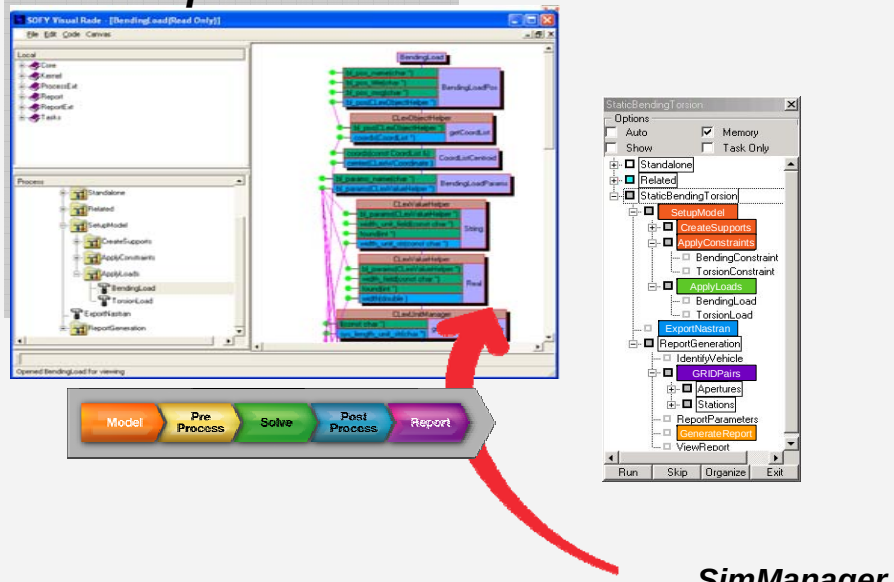
## Manage Methods & Processes

- Reusable SimTemplates & Processes
- 3rd Party Methods
- Input & Output Data

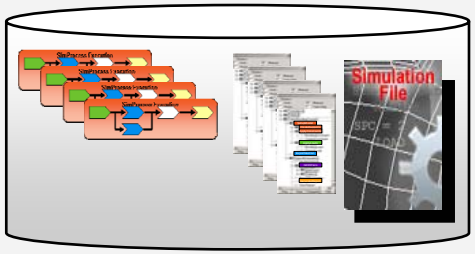
## Execute Methods & Processes

- Manage server-side execution
- Connect to HPC environment

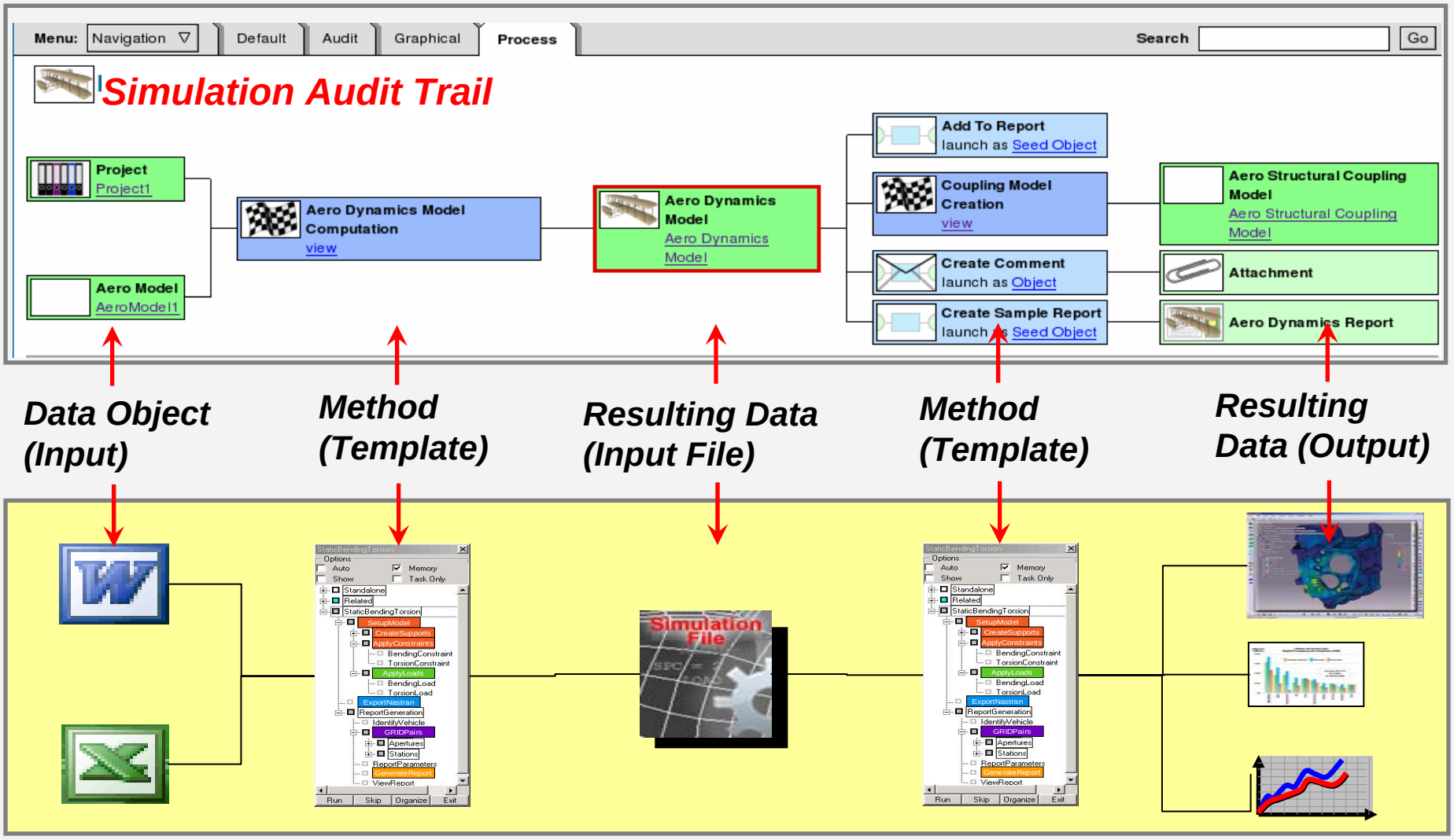
***SimTemplate Builder***




***SimManager Database***



# **Objective:** Enable Data Management in Context



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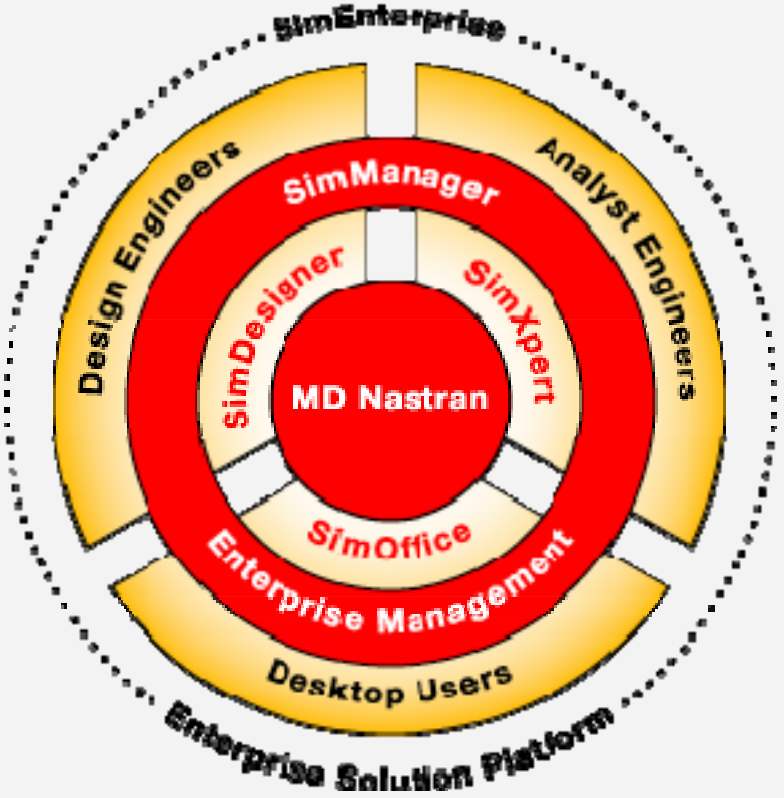
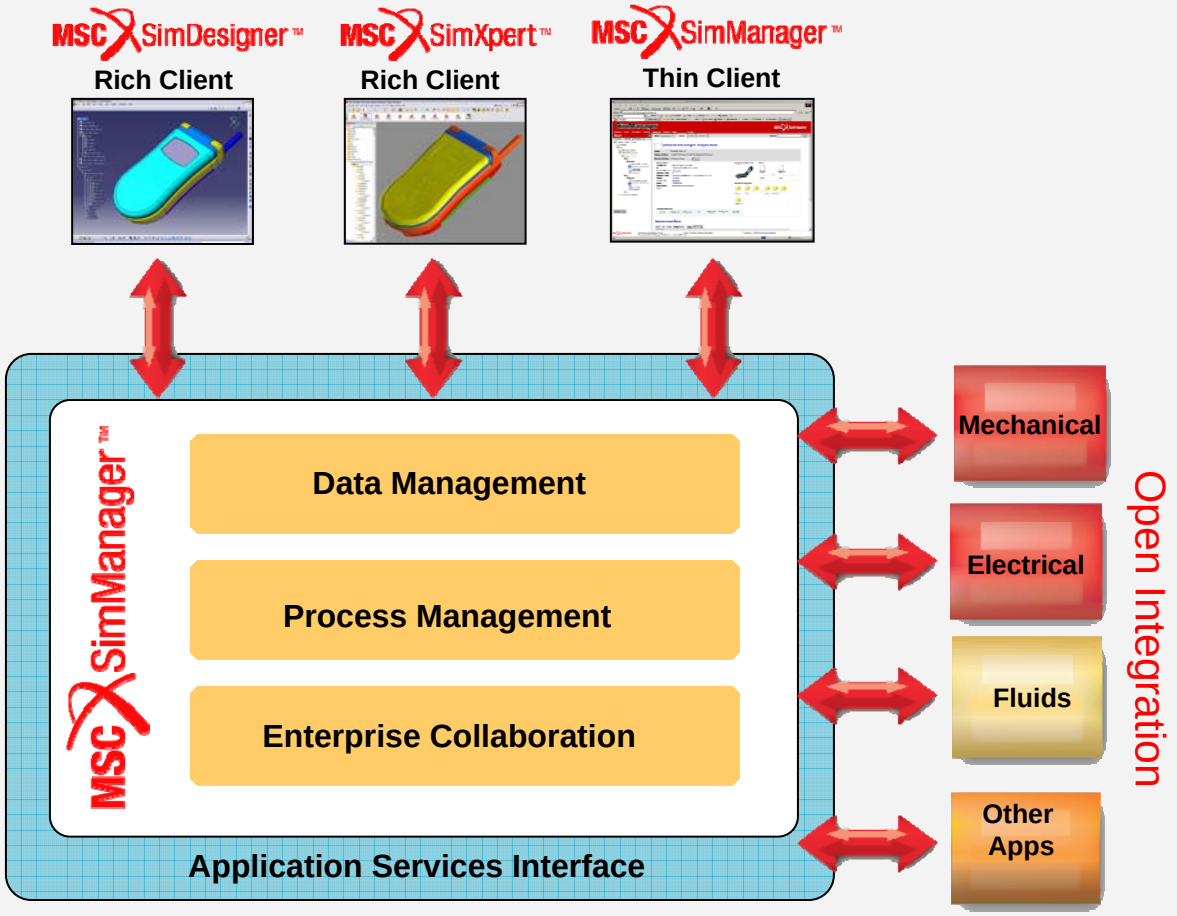
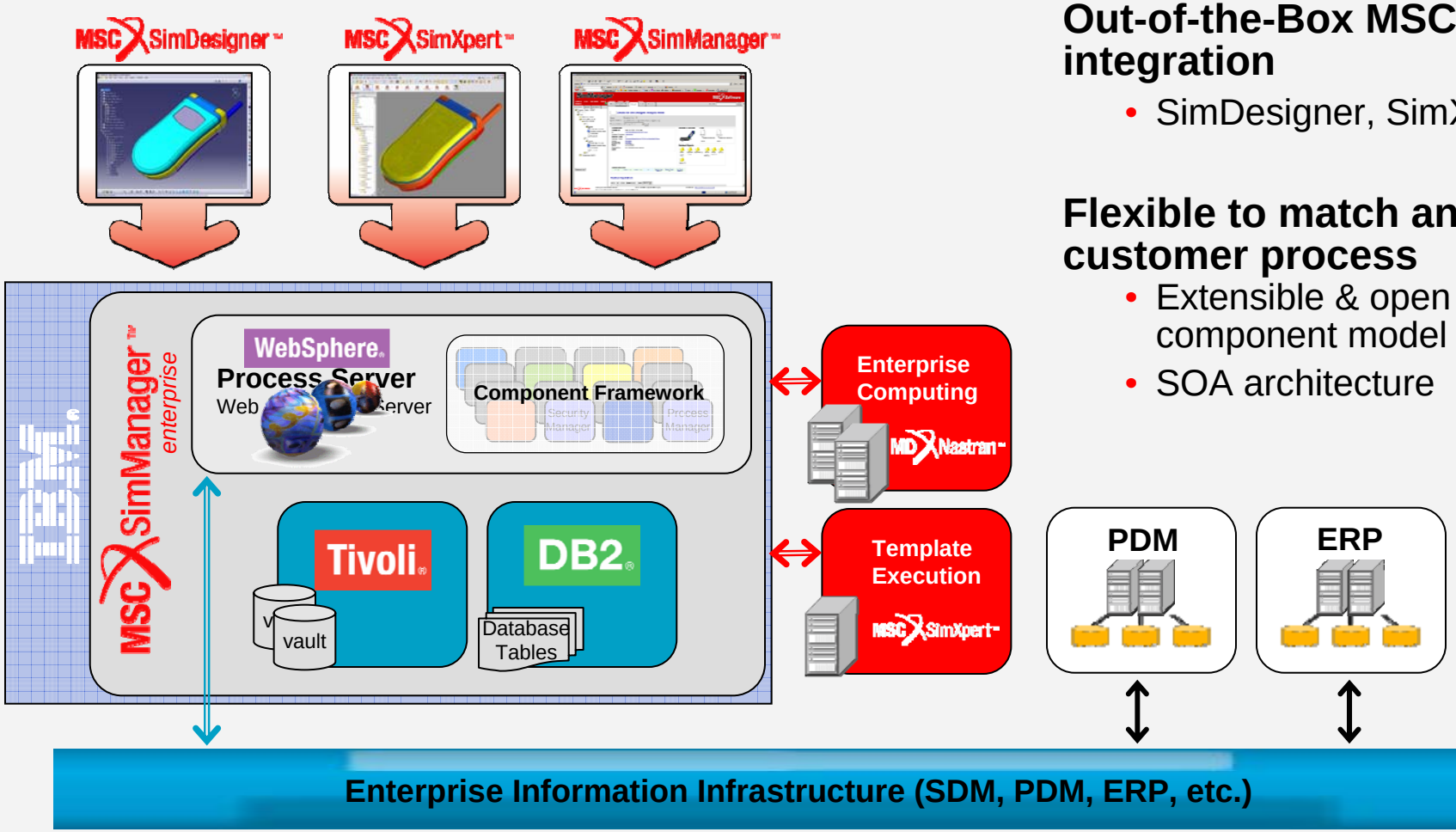


# The Hub of ESM: MSC SimManager

- **Supplements existing application environment**
  - Centralized simulation data storage and access
  - Enterprise Collaboration
  - Process Management
- **Enterprise integration**
  - Simulation
  - PLM/PDM
  - Other enterprise applications



# Integrated Enterprise Simulation Architecture




## Out-of-the-Box MSC integration

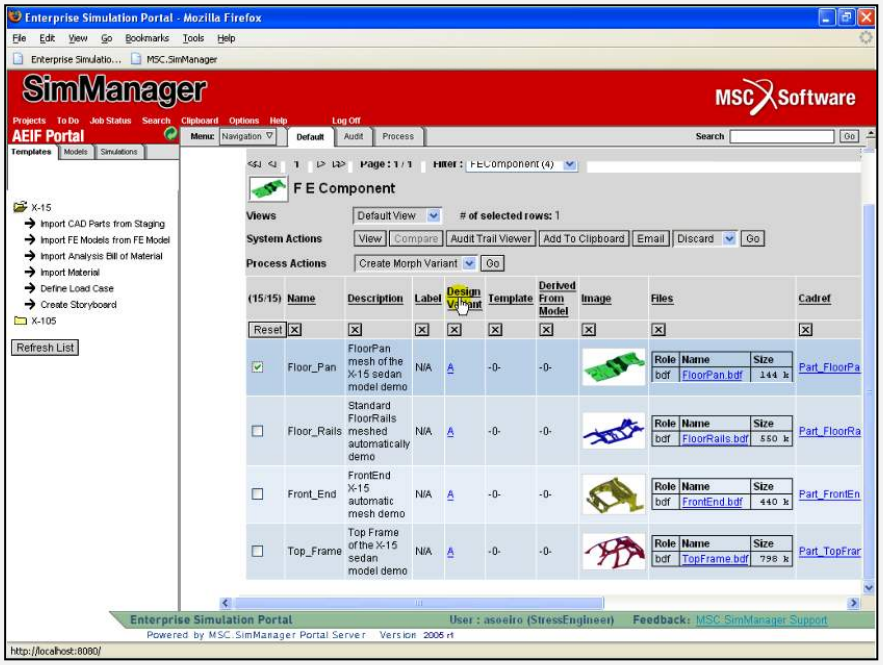
- SimDesigner, SimXpert

## Flexible to match any customer process

- Extensible & open component model
- SOA architecture

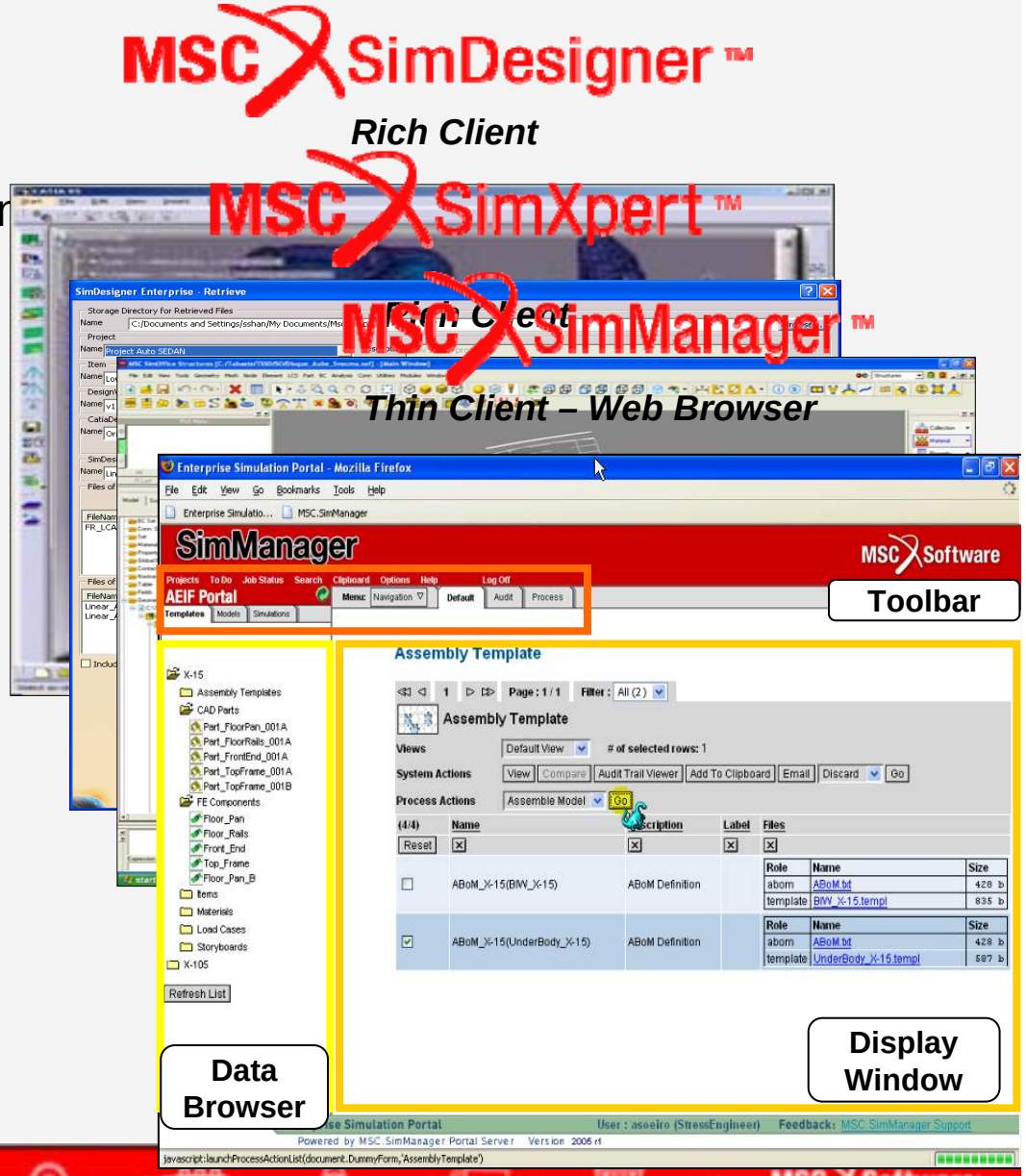
# Captures Data & Context

- **Automated storage upon method & process execution**
- **Published on-demand**
- **Eliminates point of failure for many data management systems (individual discipline)**



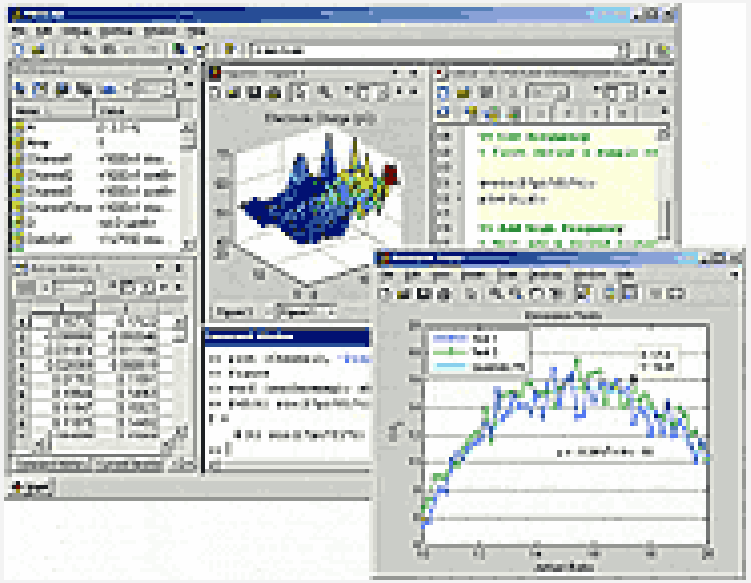
# Provides Enterprise Access to Simulation

- **Data browser**
  - Customizable data presentation
  - Multiple views organized by tabs
  - Process or data view
- **Display window**
  - Details for data objects
  - System actions
  - Data-centric process actions
- **System toolbar**
  - Organizes common functions



# Open Application Integration

- **Open integration of any application**
  - Batch applications
  - Interactive applications
- **Multi-run support**
  - SimManager provides process logic
  - Multi-run application provides logic for
    - DOE
    - Optimization
    - Stochastic
    - Robust Design



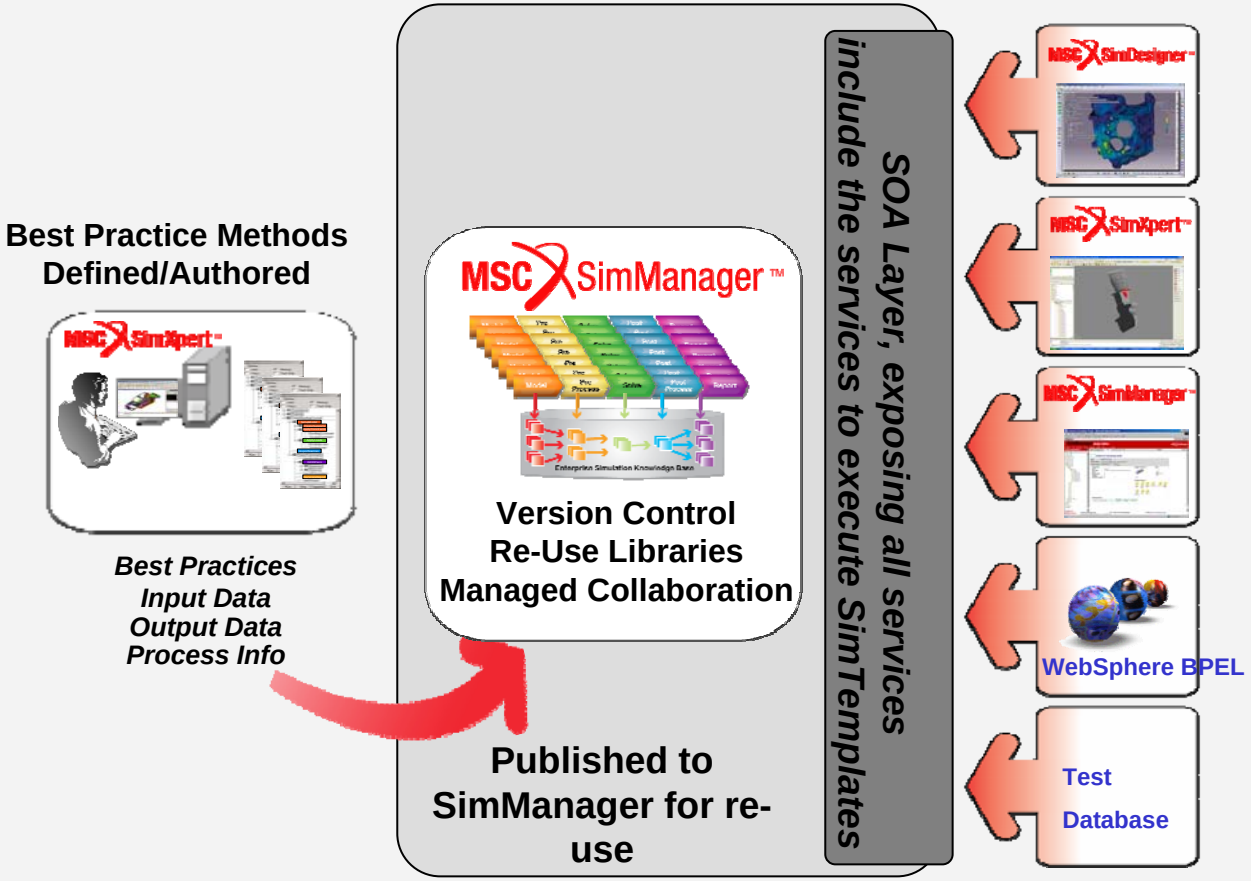
# Test Data Integration

**Leveraging SOA to**

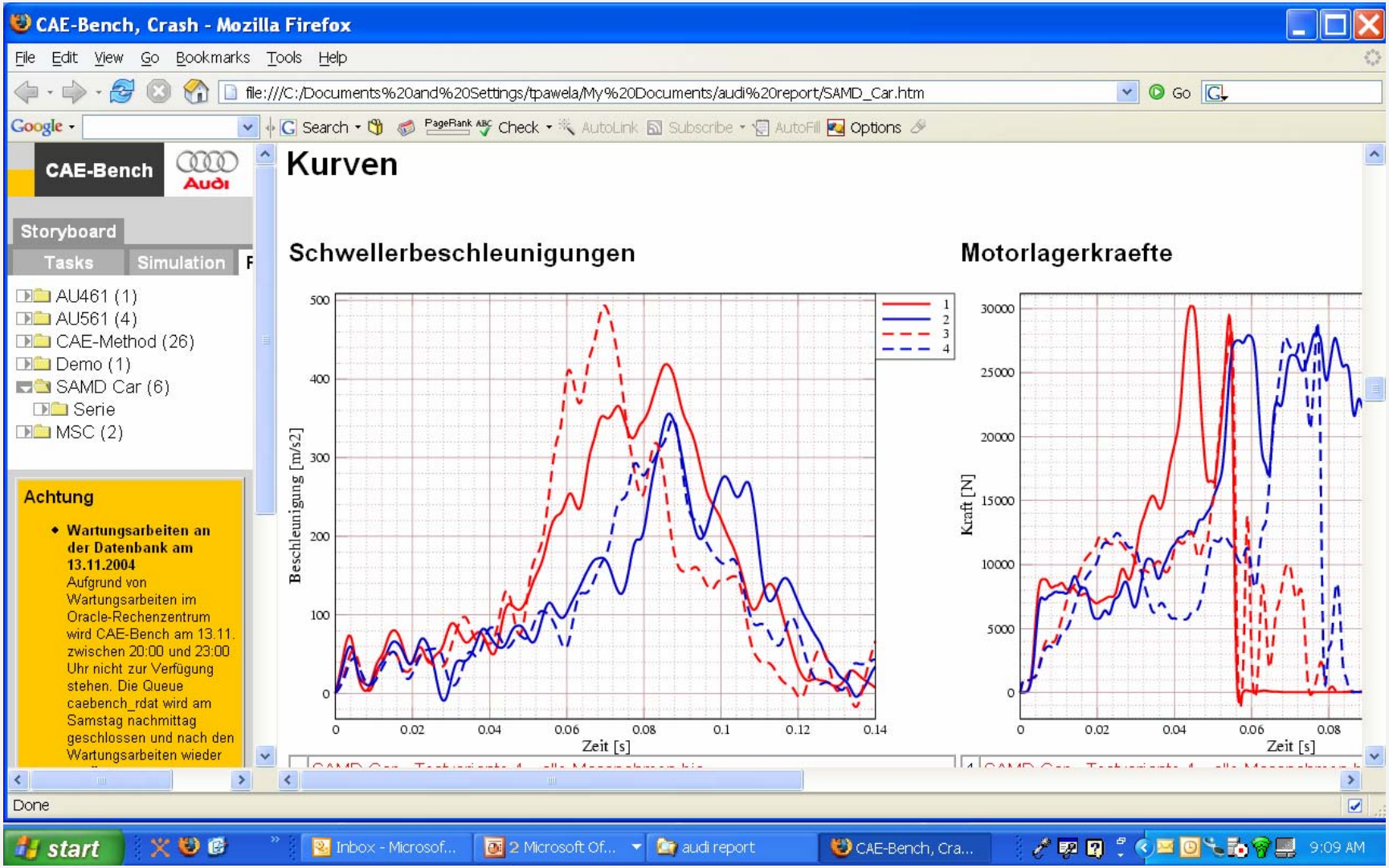
- Expose SimEnterprise services to the business
- Integrate 3rd party engineering services into SimEnterprise

**PLM integration (OpenPDM)**

**Test Data Integration**

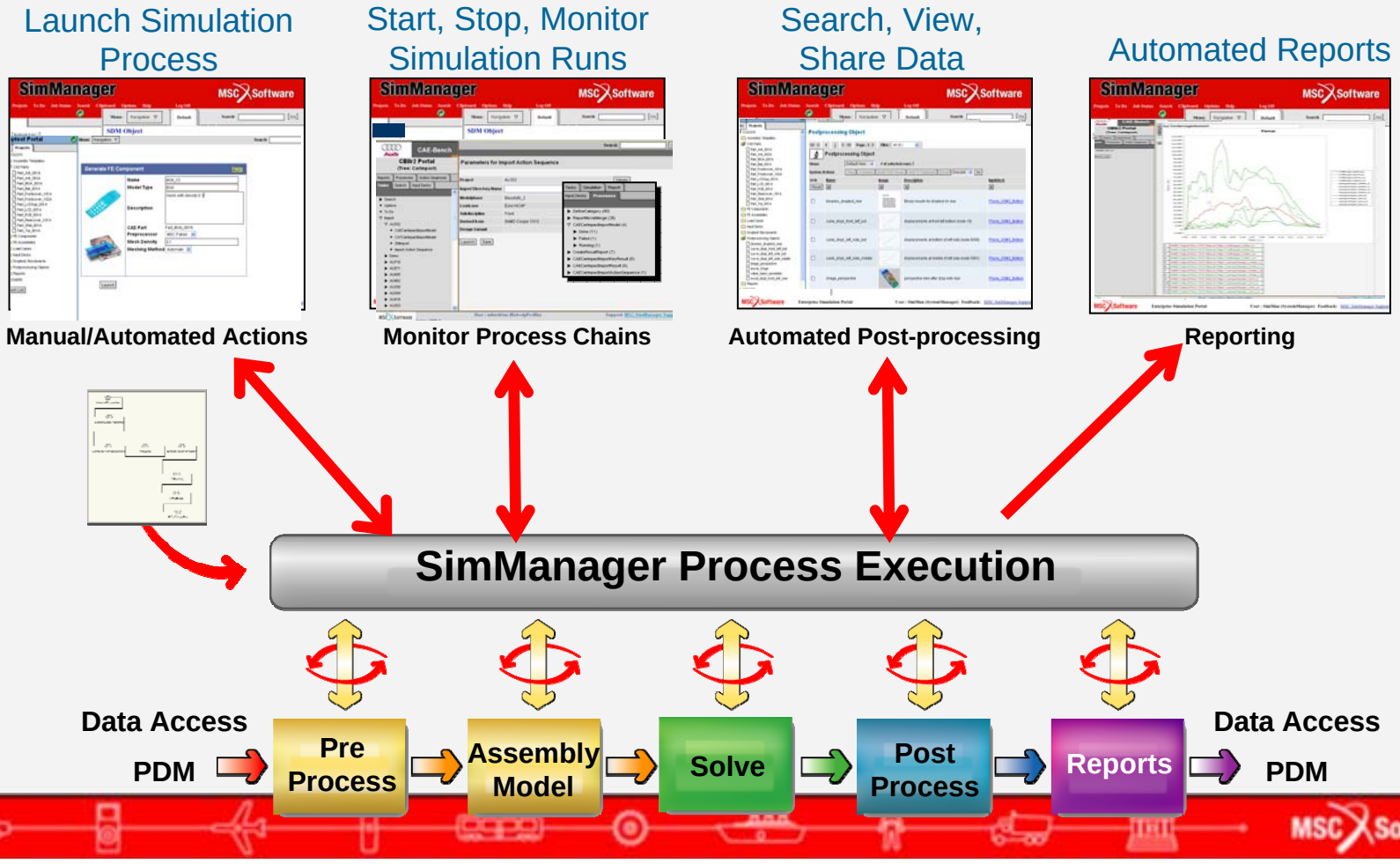


# Enabling Test/Simulation Comparison



# Enables Automation for Productivity

- **Process action sequence interpreted by SimManager**
- **Execution engine invokes background processing**
  - Any/all modeling sub-process
  - Supports distributed simulation processing



# Complements PDM / PLM

## SimManager enables PDM

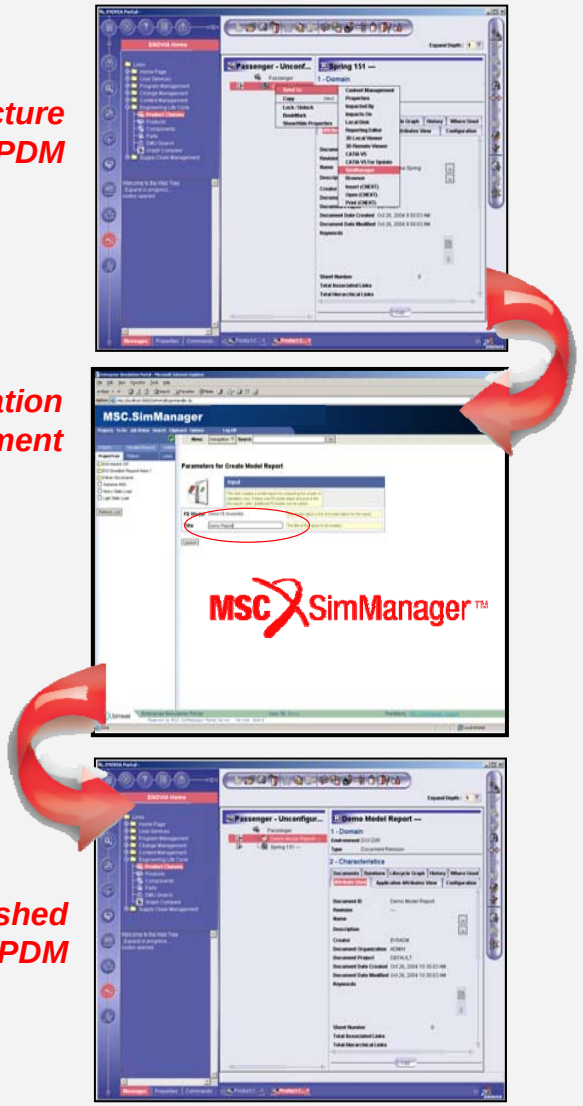
- Builds simulation knowledge base
- Establishes simulation pedigree and audit trail

## PDM to SimManager Integration

- Pointers to product data structure-part / subassembly / assembly files

## SimManager to PDM Integration

- Simulation results reports associated with product configuration
- Links to WIP and pedigree



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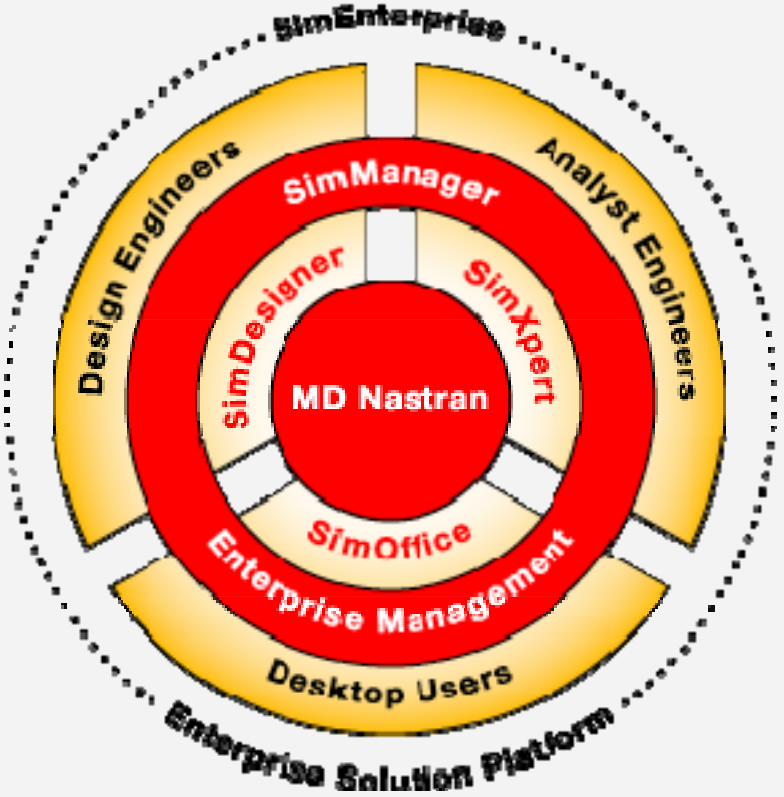
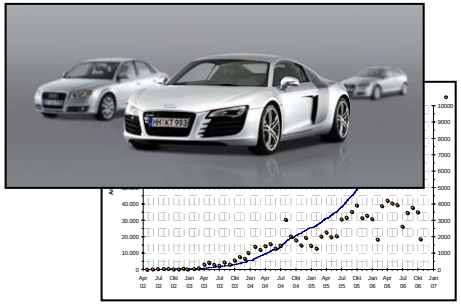


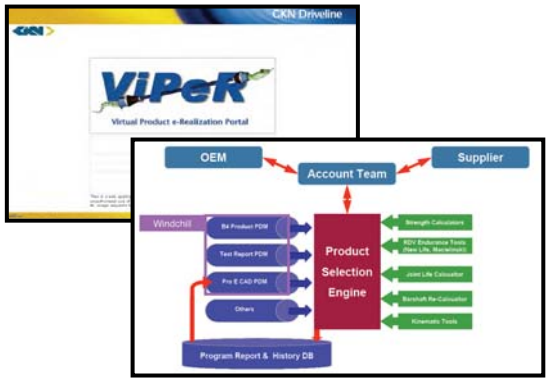
# Enterprise Customer Examples



**CAE Work Bench**

**Increase Simulation - Correlate Test**

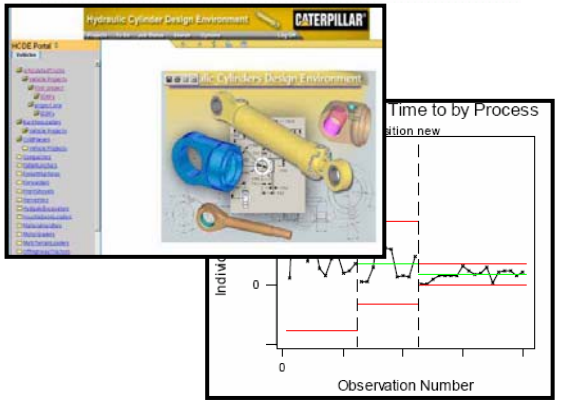
- Increasing simulation (variants, load cases)
- Predictive power in early design
- Make Physical Test more valuable, e.g. Comparison
- Enables earlier and faster Performance Analysis of the Product




**Virtual Product e-Realization Portal (VIPER)**

**Significantly Reduce Process Time**

- Global System For Drive-shaft Design
- Automates design and analysis
- Solid model creation
- Virtual Test and Analysis
- PDM Integration
- From customer specs to full design and validation in < 1 day




**Hydraulic Cylinder Design Poral**

**Analysis Driven Design**

- Automated Product Specification
- Rules Based Simulation Design
- Managed process and data
- 6 Sigma Certified Design Process
- 100% of Product Validated Virtually
- Dramatic Productivity Improvements
- Significant Design Improvements

# Audi: Value Achieved

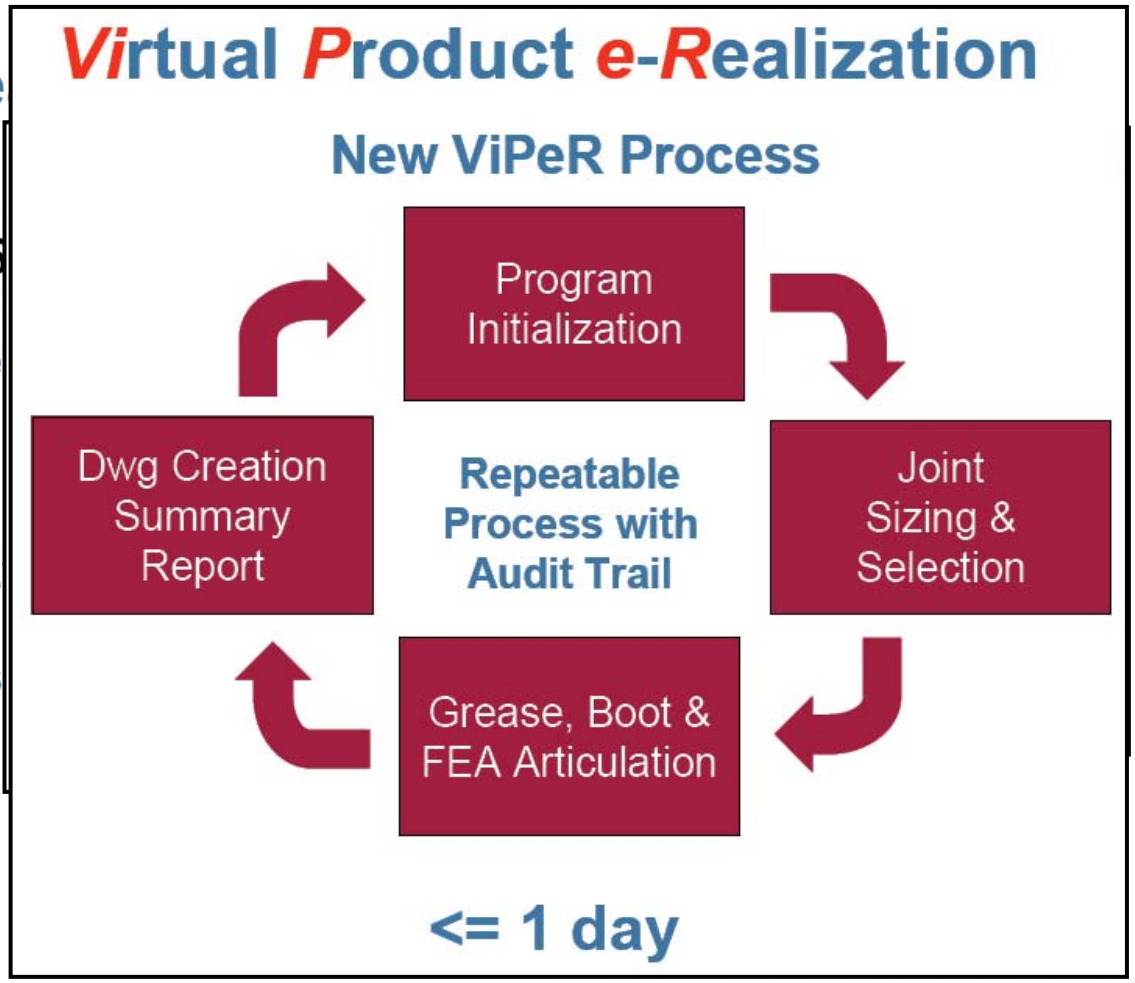
- **Method and Process Management**
  - Template approach
  - Job submission and monitoring
- **Automation**
  - Postprocessing
  - Report Generation
- **CAE/Test Correlation**
  - Crash
  - NVH
  - CFD
- **Throughput and Efficiency**
  - 70% more simulations per vehicle
  - 30% reduction in cycle time

# Success: GKN Automotive

GKN PLC

## Virtual Product e-Re

- Partnership with MSC
- Global Web Based Syste
- Knowledge Based Mgt
- Virtual Designer: Automa
- Solid Models & Drawings
- Virtual Test & Analysis

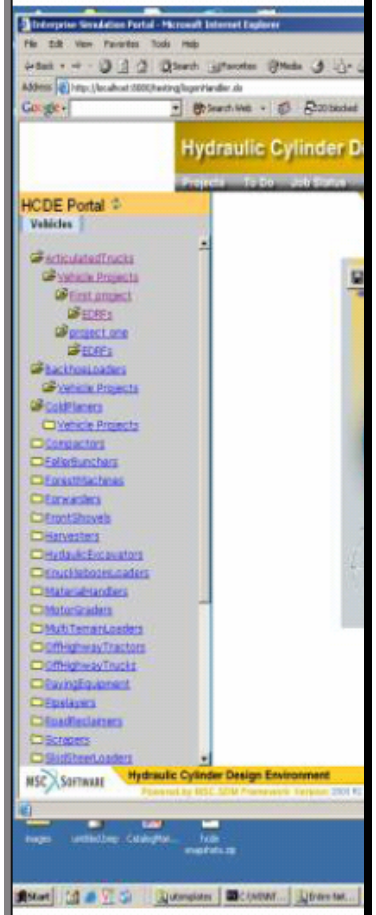


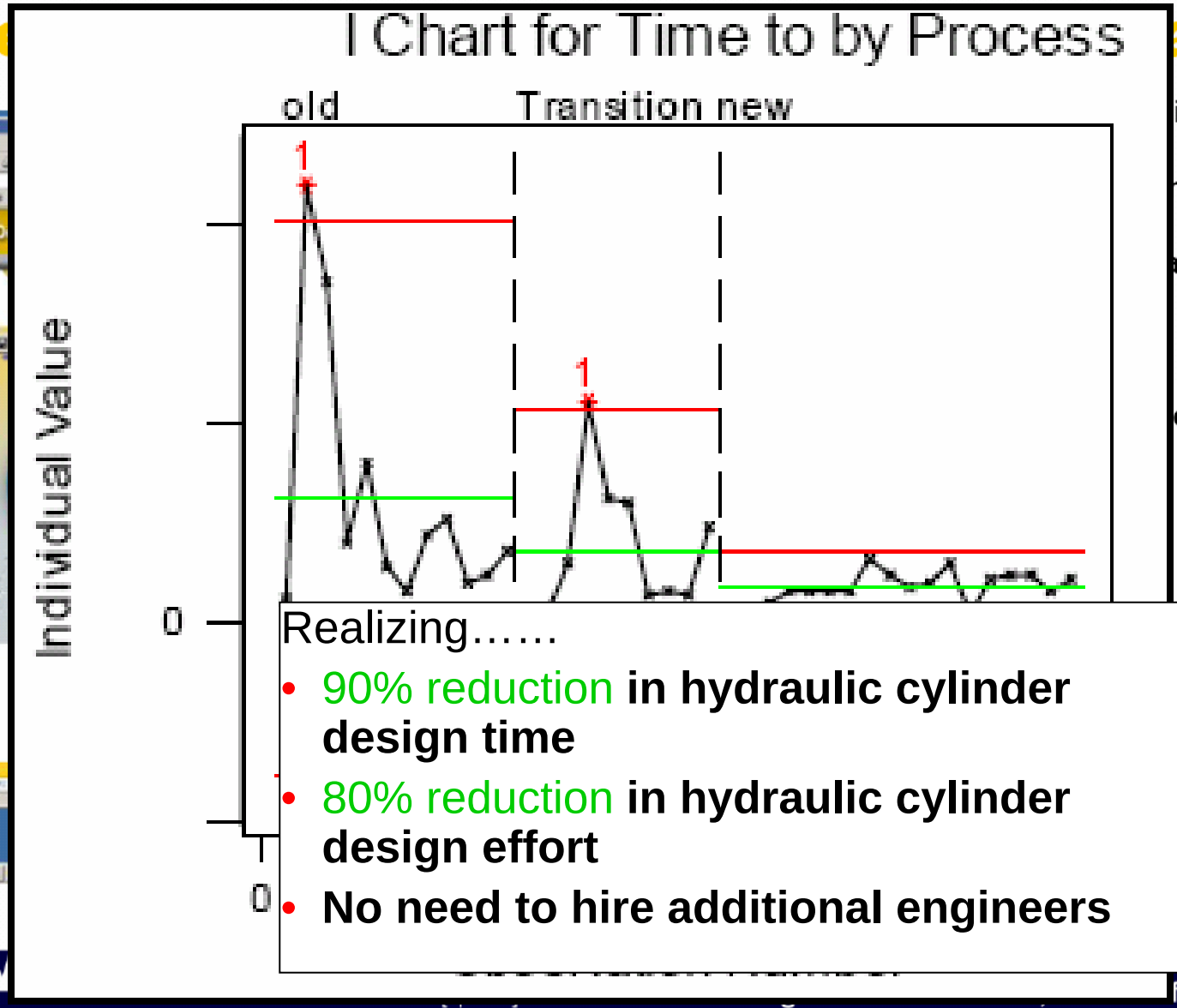

GKN TECHNOLOGY DAY > 8 NOVEMBER 2004

Process is now statistically under control

CATERPILLAR®

# Measure … ase)




Realizing……

- 90% reduction **in hydraulic cylinder design time**
- 80% reduction **in hydraulic cylinder design effort**
- **No need to hire additional engineers**

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MSC SOFTWARE.

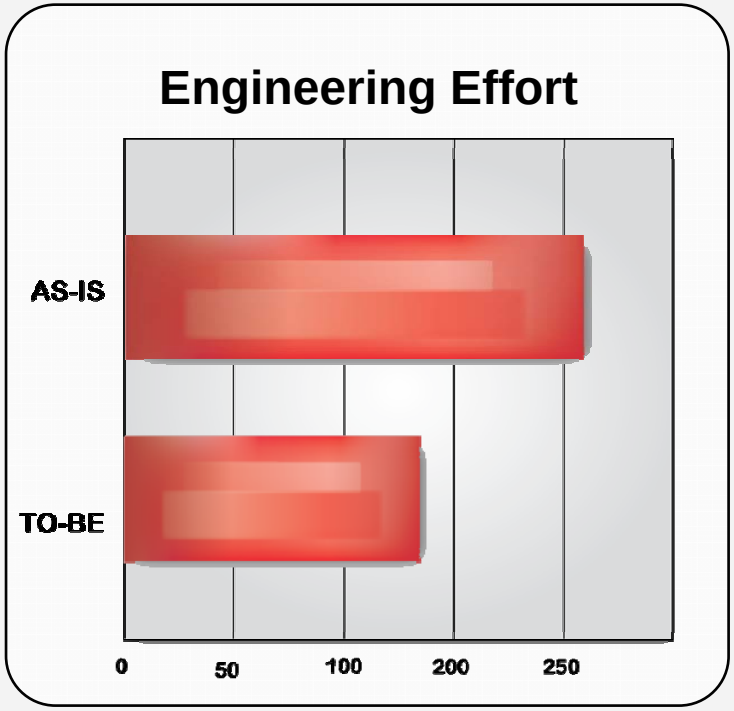
# Deliver Proven and Immediate Value

## Improved engineering reusability

- Data management standardized and automated
- Full pedigree of data and process managed
- Method & process management
- Consistent and reliable simulation

## Increased engineering throughput

- Decrease time to completion
- More engineering cycles to do more complex tasks
- No need to add personnel to achieve these benefits
- Time to innovate



# Thank You

Enterprise Simulation Management