MSC.Software Application Software
Vision and Roadmap

Douglas Peterson, Software Vice President, MSC.Software
Exciting new news... 

Acquisition of Sofy Technologies

20 product releases
6 new products

ISO certification for 4 new development teams

Countless customer success stories
MSC Product Lines

- **VPD Application Software**
  - SimOffice – Stand-alone integrated VPD environment
  - SimDesigner – VPD embedded in CAD
  - MSC.SimManager – Automate and manage collaborative VPD
Purpose: Integrated Digital Prototypes

- Strength
- Hydraulics & Controls
- Flightloads
- Rotor Dynamics
- Vibration
In the virtual world, for the real world
Associative VPD Process

- More front-loaded simulation
- To support better decisions earlier in the process
- Fast & repeatable design-simulation loop
- Easy to use / easy to understand solutions
- Knowledge capture and re-use
- Robust design
- Accurate results
Virtual Product Development

MSC Product Lines

Wing Structure
Stress, durability

Motion
Vibration
Stress
Durability
Controls
Safety
Thermal
Airflow
SimOffice Release – Oct. 2004
**MSC.ADAMS 2005**

New products:
- ADAMS/Engine Piston
- ADAMS/Car RealTime (Pre-Release)

Controls/hydraulics import from MSC.EASY5

ADAMS linear model export to MSC.Nastran

New event generator and driver in ADAMS/Car

Fatigue hotspots 3x faster in ADAMS/Durability

Flex body swapping and AutoFlex Manager

New tire and road/runway simulation tools

ADAMS/Insight integrated w/ MSC.Robust Design

Frequency-dependent elements

Engine chain and belt speed improvements
- 5-15 times faster

Full Linux support
MSC.Patran 2005

Preprocessing improvements
- CAD model management through layer recognition
- Advanced Surface Mesher FEM/geometry interoperability
- LBC display performance for large models

Enhanced Solver Preferences
- Nastran double precision
- Nastran connector element support (CWELD, CFAST)
- Implicit nonlinear (Sol 600) combined analysis cases
- Marc improved connectors and materials
- Dytran Fluid Structure Interaction (FSI)
- LS Dyna additional keyword support
- New Beta options:
  - Explicit Nonlinear SOL 700 (LS Dyna)
  - Quick topology optimization

Postprocessing
- Combined component plots & scalar marker tool
- Quick plot animation
- Results title wizard
New Capabilities:
• Nastran Explicit Nonlinear Support
• EXCEL output
• Design variable functions
MSC.Sofy 2005 R1

Automotive processes
- Acoustics process
- 5 generic processes

Process enablers
- Mesh morphing
- CATIA V5 geometry import
- Solids meshing

Access
- MasterKey licensing
SimOffice Release Schedule - 2004

2004 R2-3
February - May

- MSC.EASY5
  - MasterKey
- MSC.Nastran
  - ACMS
- MSC.Patran
  - V5 & Nastran Compatibility

2005 R1
October

- MSC.Nastran
  - Solver Integration, MDACMS
- MSC.Patran
  - Preferences
- MSC.ADAMS
  - EASY5, Nastran Integration
- MSC.Marc
  - Multi-Physics
- MSC.Dytran
  - FSI, LS-Dyna

December - February

- SimOffice Results
  - NVH & Aero
- MSC.Sofy
  - Solid mesh
- MSC.EASY5
  - Schematic components
### SimOffice Interoperability & Integration

Guided by targeted application domains, the attributes of SimOffice will come together:

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MSC Software Platform

**Designer**
- SimDesigner

**Engineer/Analyst**
- SimOffice

**Program Manager/Engineer**
- SimManager

**Industry Applications**
(Aero, Auto, EM, Bio, in-house, partners)

**Interface Workbenches**
(Patran, Sofy, Actran, View, etc.)

**Modeling Components**
(Build, Test, Review, Improve)

**MSC Proven Solvers**
(Nastran, ADAMS, Marc, Dytran, Easy5)

**Enterprise Information Infrastructure**
(PDM, PLM, ERP, Directory Services, etc.)
**SimOffice Framework Character**

**Performance**
- Fast, responsive and robust

**Capacity**
- Able to handle extreme model sizes

**Scalable**
- From educational to enterprise user
- From conceptual to detailed simulations
- Within an integrated environment
- With integrated VPD attributes

**Ease of Use**
- State-of-the-art user interface
- Consistent user interaction model across all products

**Customization and Extensibility**
- Customization, extension and process capture built in to the architecture

**Based on proven technology**
- Create from components used in our products today
Integration

Functionality migrates from existing products to SimOffice over multiple releases

Starting with post-processing
SimOffice Framework

- Functionality migrates from existing products to new look and feel and integrated framework over multiple releases.

- Common Menus
  - Common Look and Feel, Toolbars

- Multidisciplinary engineering contexts

- Communication Gateway
Existing applications initially connect to SimOffice Framework

Connected applications can leverage SimOffice components and services

Smoothly transition to 100% SimOffice look-and-feel over time

SimOffice Results:
- MSC.Akusmod
- MSC.Explore
- Plots & Charting
- Report Templates

MSC.Patran 2006 will be SimOffice-compliant and leverage SimOffice Results
mySimOffice and SimOffice Results

- **mySimOffice**
  - Easier communication with MSC.Software
  - Receive news and broadcasts
  - Send enhancement requests and problem reports
  - Leverage common installer/launcher
  - Access knowledge base and discussion forums

- **SimOffice Results**
  - First SimOffice interface release
  - Aerospace and NVH focus
  - Large capacity & high performance
  - Process capture and re-use (report templates)
  - MSC.Explore (Aero) and MSC.Akusmod (Noise) migrate to SimOffice
SimOffice Roadmap

Phase 1:
Postprocessing
2004-2005

- MasterKey Licensing
- Solver Data Integration
- Documentation
- Installation

- Foundation Services
- Results – NVH & Aero
- mySimOffice

Phase 2:
Breadth
2005-2006

- Patran Migration I
- Results II
- SimManager I
- Mid-Range & Education
- Template Builder

Phase 3:
Depth
2006 and beyond

- Patran Migration II
- Hi-end FE & MB
- System I (EASY5)
- SimManager II
- Assemblies
- Robust Design I

Phase 0: Packaging & Data Integration
2003-2004
SimDesigner
SimDesigner for CATIA V5

Gateway Products
- MSC.Nastran
- MSC.Marc
- STEP-AP209
- ANSYS
- ABAQUS
- LS-DYNA

Vertical Apps
- Suspension
- Auto
- Aero
- Other

Vertical Apps
- Linear
- Nonlinear
- Thermal
- ASP
- Motion
- Flex
- Fatigue
- Composites
- Materials
- Crash
- Controls
- Robust Design

CATIA V5 Products
- EST
- GDY
- GAS
- FMS
- FMD

Analysis and Simulation
SimDesigner for CATIA V5 Products

SDL - SimDesigner Linear
   Linear structural analysis

SFA - SimDesigner Fatigue
   Fatigue analysis

SDT - SimDesigner Thermal
   Heat transfer analysis

SDN - SimDesigner Nonlinear
   Nonlinear structural analysis

ASP - SimDesigner Advanced Structures Pro
   Extended pre-postprocessor

SCP - SimDesigner Composites
   Laminate composites structural analysis

SMO - SimDesigner Motion
   Dynamic motion simulation

SDF - SimDesigner Flex
   Flexible body simulation

SDS - SimDesigner Suspension
   Vertical application for Suspension simulation

Gateway Products - SimDesigner Gateway for MSC.Nastran, MSC.Marc, LS-DYNA, ANSYS, ABAQUS, STEP AP209
   Bi-directional access to your corporate resources
Scalable Solution

- **Enterprise**
  "Completeness"

- **Professional**
  "Flexibility"

- **Desktop**
  "Accessibility"

Adv. Structures 2
Adv Structures Pro(1)
SimDesigner Linear
Advanced Structures Pro (ASP)

Overview

- Advanced and manual finite-element pre-processing and post-processing
- Eliminate or reduce the need for complex geometry operations for mesh generation.
- Legacy FEM data can be imported and merged with other imported data or newly created FEM data.
- Operations remain generative.
Advanced Structures 2 (AS2)

Overview

• Analyst tools for manual finite-element pre-processing and post-processing
  • Mid-Surface Mesh
  • Mesh on Mesh
  • Advanced elements (Axisymmetric, superelement)
SimDesigner Suspension

- Parametric Suspension
- Design Templates
- Virtual Test Rig
- (Elasto-) Kinematics
- Load Cases
- Dynamic DMU

Suspension Simulation in CATIA V5
SimDesigner Composites

- Conceptual Studies on Composite Parts
- Orthotropic Material
- FEM Properties
- Failure criteria

Laminate Composite Structures Modeling in CATIA V5

PRODUCT DEVELOPMENT CONFERENCE

MSC Software
2004 v [pd] • Huntington Beach, California
SimDesigner Flex

• Part Flexibility
• Use Powerful MSC.Nastran and MSC.ADAMS
• Stress/Deflection Results Applied to DMU

Model Flexible Bodies in Motion
SimDesigner Release Schedule - 2004

SimDesigner 2004 R3
CATIA V5R13
April
✓ SD Composites
- FE Based
✓ SD Gateway for LS-Dyna
✓ SD Fatigue
✓ SD Flex
✓ SD Adv. Structures Pro
- Phase 2
✓ SD Linear
- Modal Freq. Resp.

SimDesigner 2005 R1
CATIA V5R13
October
✓ SD Materials
✓ SD Adv Structures Pro
- Phase 3

SimDesigner 2005 R2
CATIA V5R14
December
✓ SD Adv. Structures Pro.
- Phase 4
✓ SD Motion
- SDL Load Transfer
✓ SD Nonlinear
- GAS Connections
✓ SD Materials
✓ SD Composites
- Design Support
✓ SD Fatigue
- SMO Interface
SimManager
MSC.SimManager
The Inner and Outer Loops of VPD

Bill of Design (BOD)

Virtual Product Definitions in PLM Vault

Bill of Analysis (BOA)

SimManager Environment

Modeling

Best-Practice Processes, Procedures, Templates

‘What if’ Optimize

Knowledge Base

Annotate / Publish

Virtual Product Definitions in PLM Vault
Integrating CAE and Product Development

Product Lifecycle

Physical Simulation (Test) Process

Numerical Simulation Process

Pre-Process  Solve  Post-Process
Integrating CAE and Product Development

Product Lifecycle

Physical Simulation (Test) Process

Numerical Simulation Process

- Pre-Process
- Solve
- Post-Process

1. Increases efficiency of the Simulation Process
Integrating CAE and Product Development

- Geometry, Simulation Inputs
- Physical Simulation (Test) Process
- Numerical Simulation Process
  - Pre-Process
  - Solve
  - Post-Process

1. Increases efficiency of the Simulation Process
2. Creates a consistent functional knowledge database
Integrating CAE and Product Development

1. Increases efficiency of the Simulation Process
2. Creates a consistent functional knowledge database
3. Increases effectiveness of functional information in the Product Life Cycle

Product Lifecycle

Physical Simulation (Test) Process

Numerical Simulation Process

Pre-Process Solve Post-Process

Functional Knowledge Base

Geometry, Simulation Inputs

Functional Properties, Design Suggestions
Virtual Product Development

MSC Product Lines

Wing Structure
Stress, durability

Motion
Vibration
Stress
Durability
Controls
Safety
Thermal
Airflow

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Driving Virtual Product Development

Thank You!
Virtual Product Development

Virtual Prototype Build

Regular Assembly of Updated System Virtual Prototypes
Virtual Product Development

Virtual Prototype Test

- Stress
- Motion
- Vibration
- Durability
- Controls
- Airflow
- Thermal
- Safety
Virtual Product Development

Virtual Prototype Review