



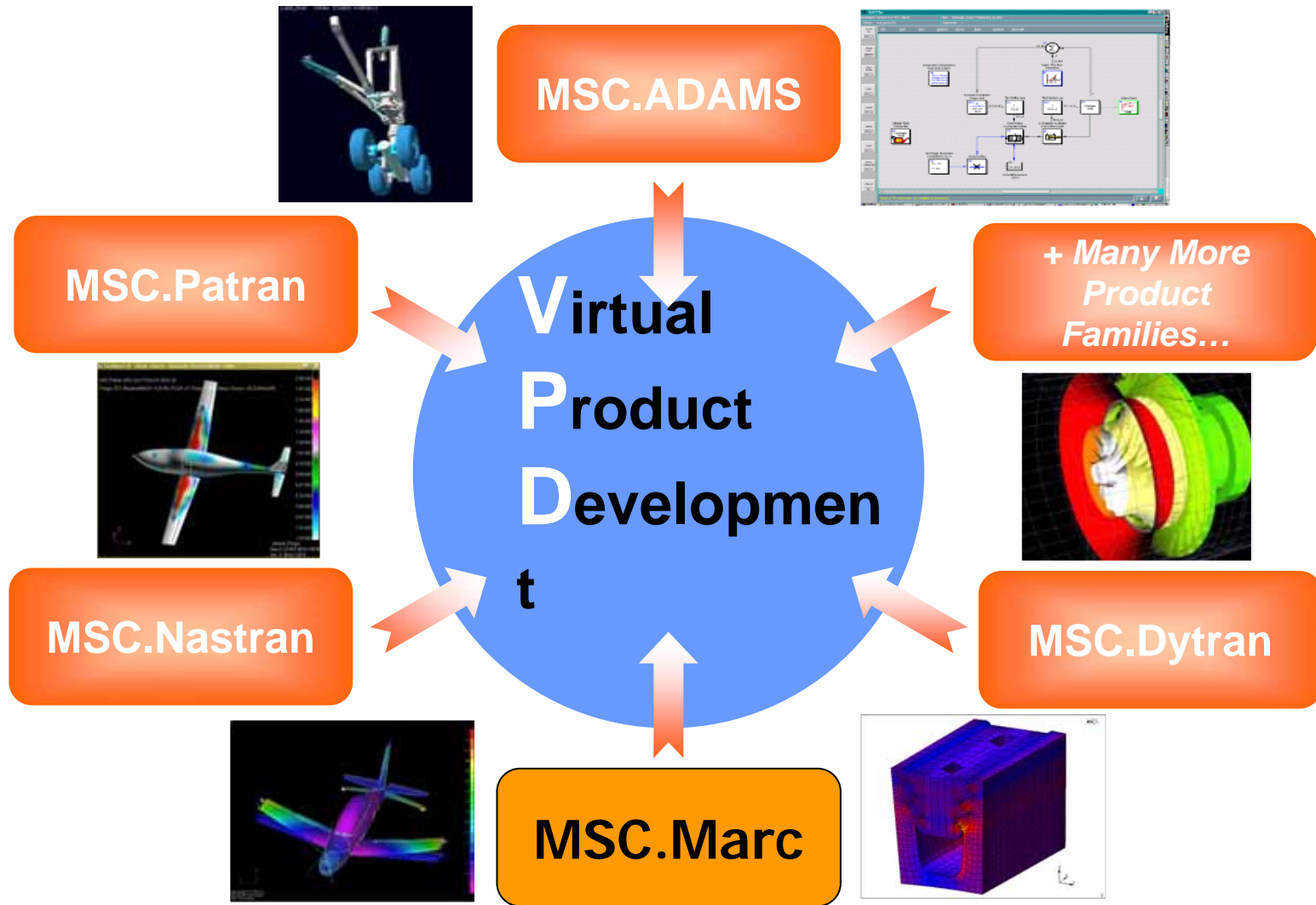
MSC.Marc 2005 What's New

Dan Wolf

MSC.Marc Product Manager

MSC.Software Corporation

MSC.Marc in the SimOffice Product Line



PRODUCT DEVELOPMENT CONFERENCE

What's New in MSC.Marc 2005

General Enhancements:

- Contact and Friction Improvements
- Table Input
- Global-Local Analysis
- Global Remeshing
- Update ACIS and ITI libraries for Mentat

Manufacturing Capabilities:

- Machining Phase II
- Pre-State
- Welding
- Parallel Adaptive Meshing

Performance

Enhancements:

- Scalability Improvements in Parallel
- Parallel Processing Single Input File
- Parallel with Adaptive Meshing

Power Train Capabilities:

- Bolt Modeling

Materials Support:

- Generalized Strain Energy
- Shape Memory Alloys

Multiphysics Support:

- Thermal Enhancements
- Electrostatics-Mechanical
- Magnetostatics Enhancements

Integration Capabilities:

- RBE3 – Large Displacement Enhancements (Marc-Nastran Integration)
- ADAMS-Marc Interface
- Marc Preferences in Patran

How to Access What's New

MSC.Marc Mentat 2005 Beta 3 changelist #24560 (32bit) (OpenGL): model3.mud

FILE I/O
MODEL
model3

MSC.Marc Mentat Help

HELP
ABOUT
THIS VERSION
GETTING HELP
RELEASE GUIDE
WHAT'S NEW
PRODUCT DOCUMENTATION
INSTALLATION GUIDE
USER'S GUIDE
VOLUME A: THEORY AND USER INFORM
VOLUME B: ELEMENT LIBRARY
VOLUME C: PROGRAM INPUT
VOLUME D: USER SUBROUTINES
VOLUME E: DEMONSTRATION PROBLEMS
COMMAND REFERENCE MANUAL
PYTHON MANUAL
MAR103 EXPERIMENTAL ELASTOMER AM
ONLINE HELP
TEXT PDF
DEMONSTRATIONS
RUN A DEMO PROBLEM
HOLES IN PLATE (Python)

Adobe Acrobat - [What's New in MSC.Marc2005.pdf]

MSC.Marc 2005 Functionality

MSC.Marc 2005 Functionality

Contact with Transformations

Contact Runs 2.2 Times faster

Contact Bodies

Contact Enhancements

Virtual Reality

Customer Success Story: Contact with higher order elements. Magnitude and location of failure accurately predicted.

Stretch & Drap Technology = 40% speed up

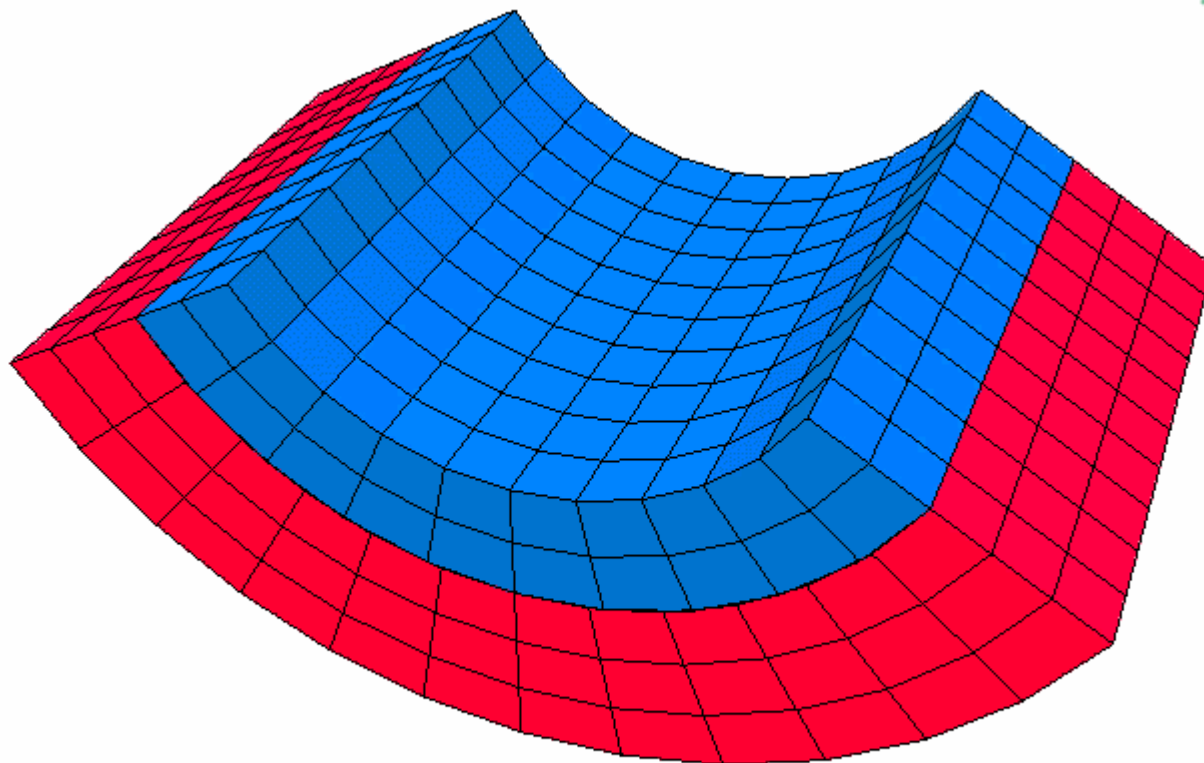
Ready

Command >

Play Movies from pdf file

Contact with Transformations

MSC



Contact Bodies

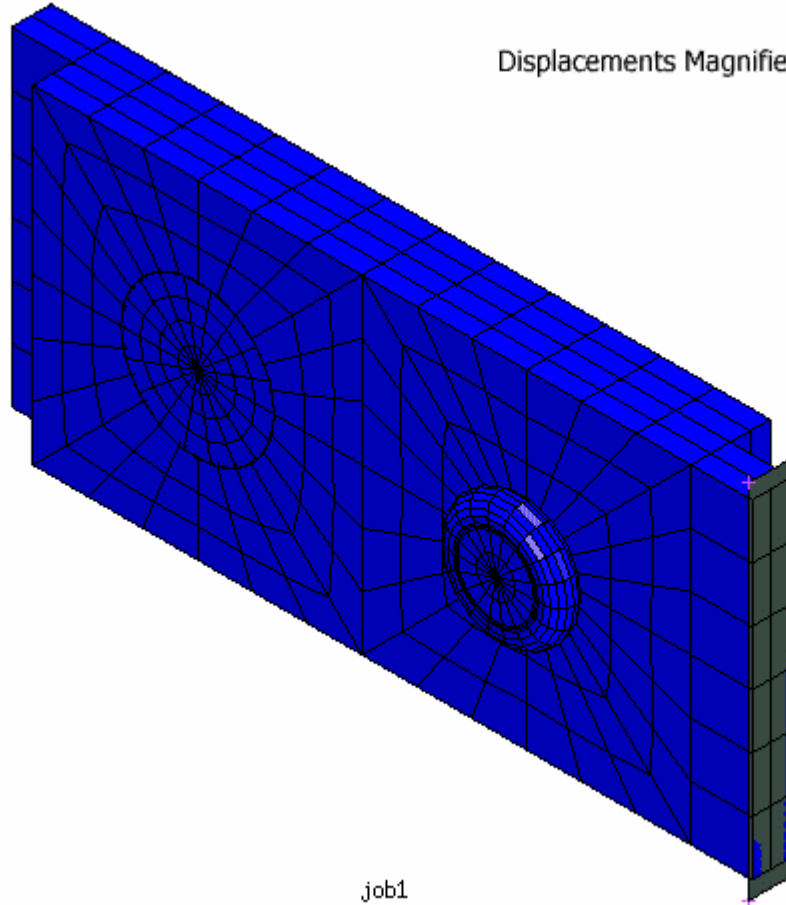
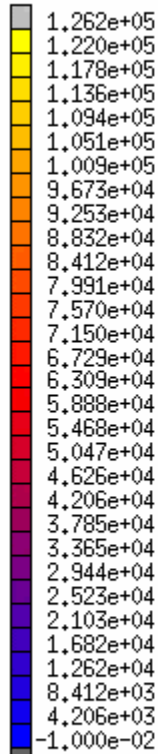
PRODUCT DEVELOPMENT CONFERENCE

Contact Runs 2.2 Times faster

Inc: 0
Time: 0.000e+00



Displacements Magnified 10X

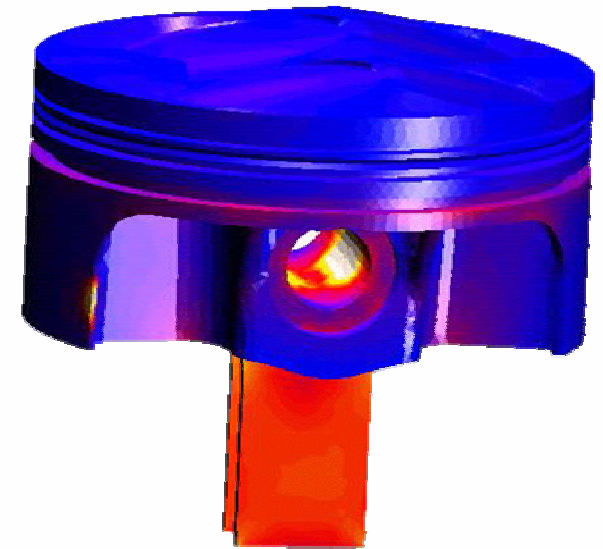


job1
Equivalent Von Mises Stress

With Better Control Of Separation

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Contact Enhancements

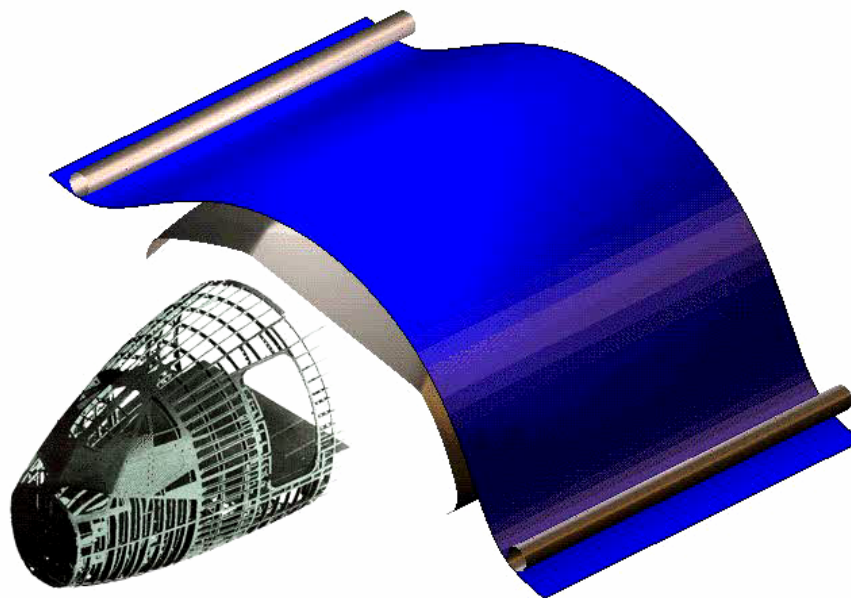


Customer Success Story:
Contact with higher order elements: Magnitude and location of failure accurately predicted

PRODUCT DEVELOPMENT CONFERENCE

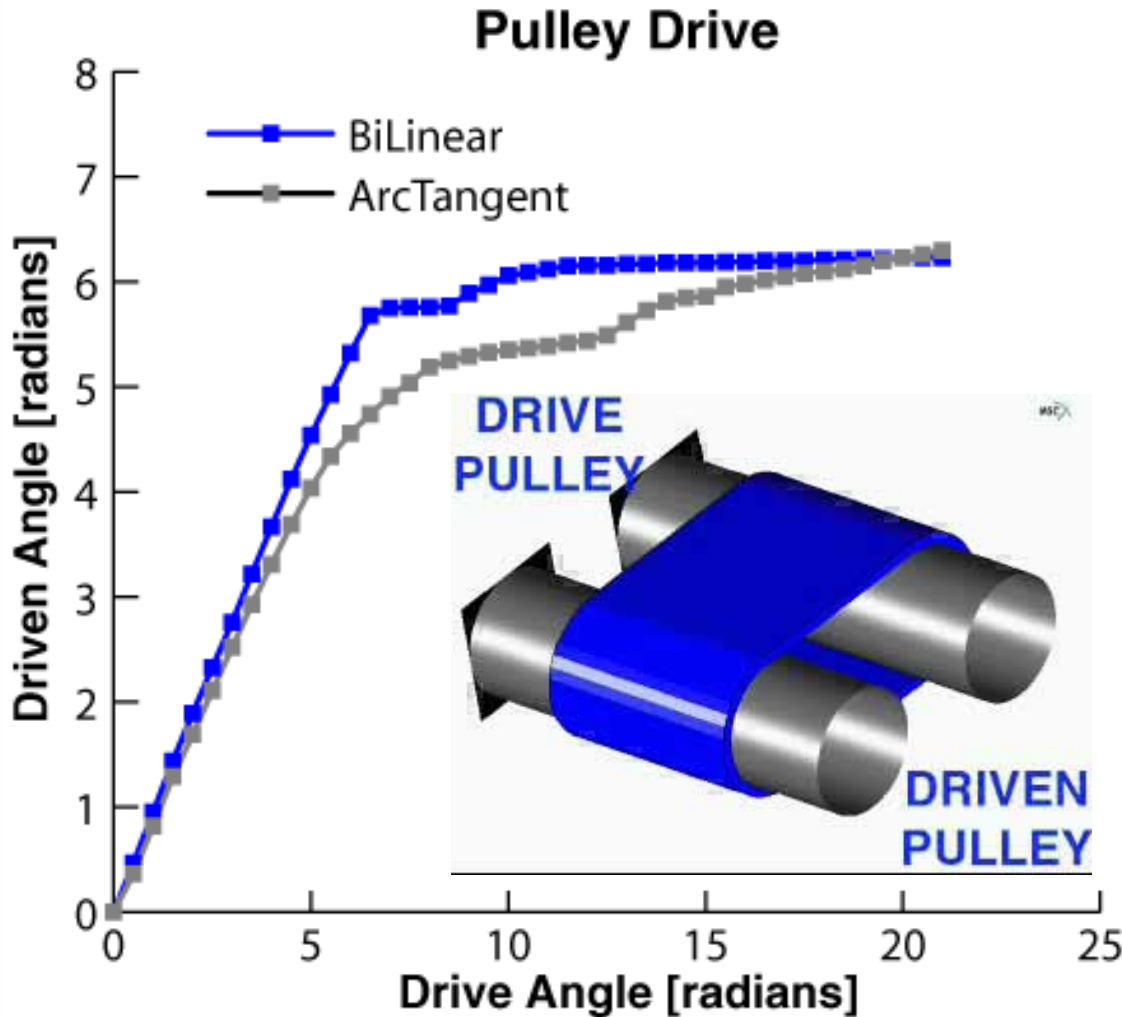
Virtual MFG Advances

Stretch & Drape Forming: New Element Technology = 40% speed up



Version	Element Type	Run Time		Memory	
		(sec)	(% less)	(MW)	(% less)
2001	75	337	0%	11.1	0%
2003	75	265	27%	9.80	13%
2003	140	231	46%	6.50	71%

Friction Modeling Improvements

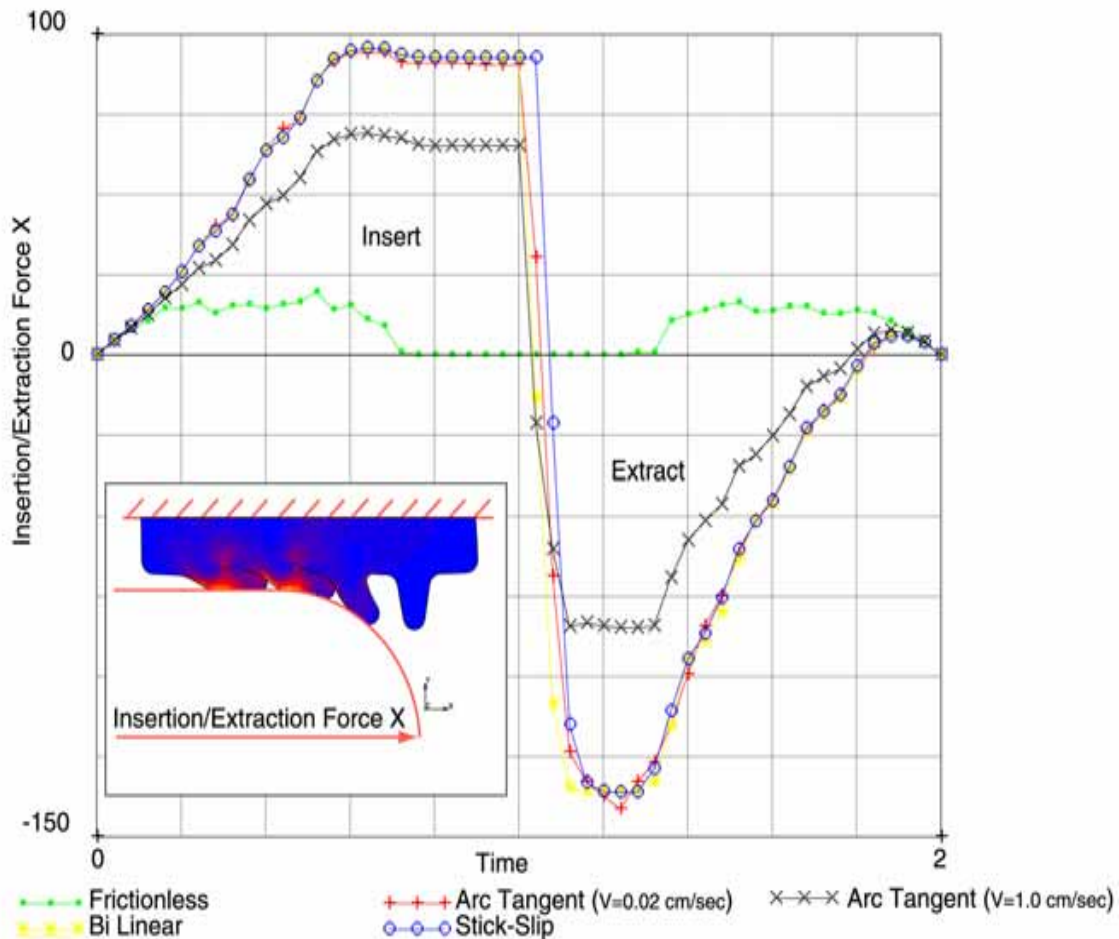
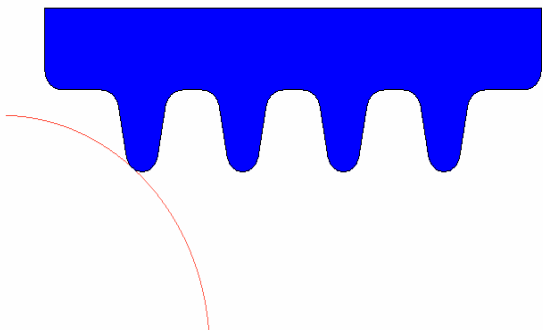


CONTACT CONTROL	
FRICION	
TYPE	COULOMB
NUMERICAL MODE	ARCTANGENT (VELOCITY)
	BILINEAR (DISPLACEMENT)
	STICK-SLIP
PARAMETERS	
FRICION FORCE TOLERANCE	0.05
SLIP THRESHOLD	AUTOMATIC SET
INITIAL CONTACT	
ADVANCED CONTACT CONTROL	
OK	

NUMERICAL PREFERENCES	
BOUNDARY CONDITION PENALTY MULTIPLIER	1e+09
2-D CONTACT LIMIT ANGLE	8.625
3-D CONTACT LIMIT ANGLE	20
INITIAL FRICTION STIFFNESS	1e+10

Friction Modeling Improvements

MSC



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Multivariable Table Input

Improves the ease of use

Increases the product capabilities

Improves the accuracy by allowing continuous functions

Reduces the size of the input file

Minimizes the need for user subroutines

Improve compatibility with CAD programs

Improves compatibility with Patran and Mentat

Improve compatibility with MSC.Nastran TABLE* BDF

Allows parametric input (not in Mentat)

Table Input - Contact

The screenshot displays the MSC Marc Mentat 2003 (32bit) (OpenGL) software interface. The main window shows a 3D model of a contact setup with a pink sheet and a punch. The interface is divided into several panels:

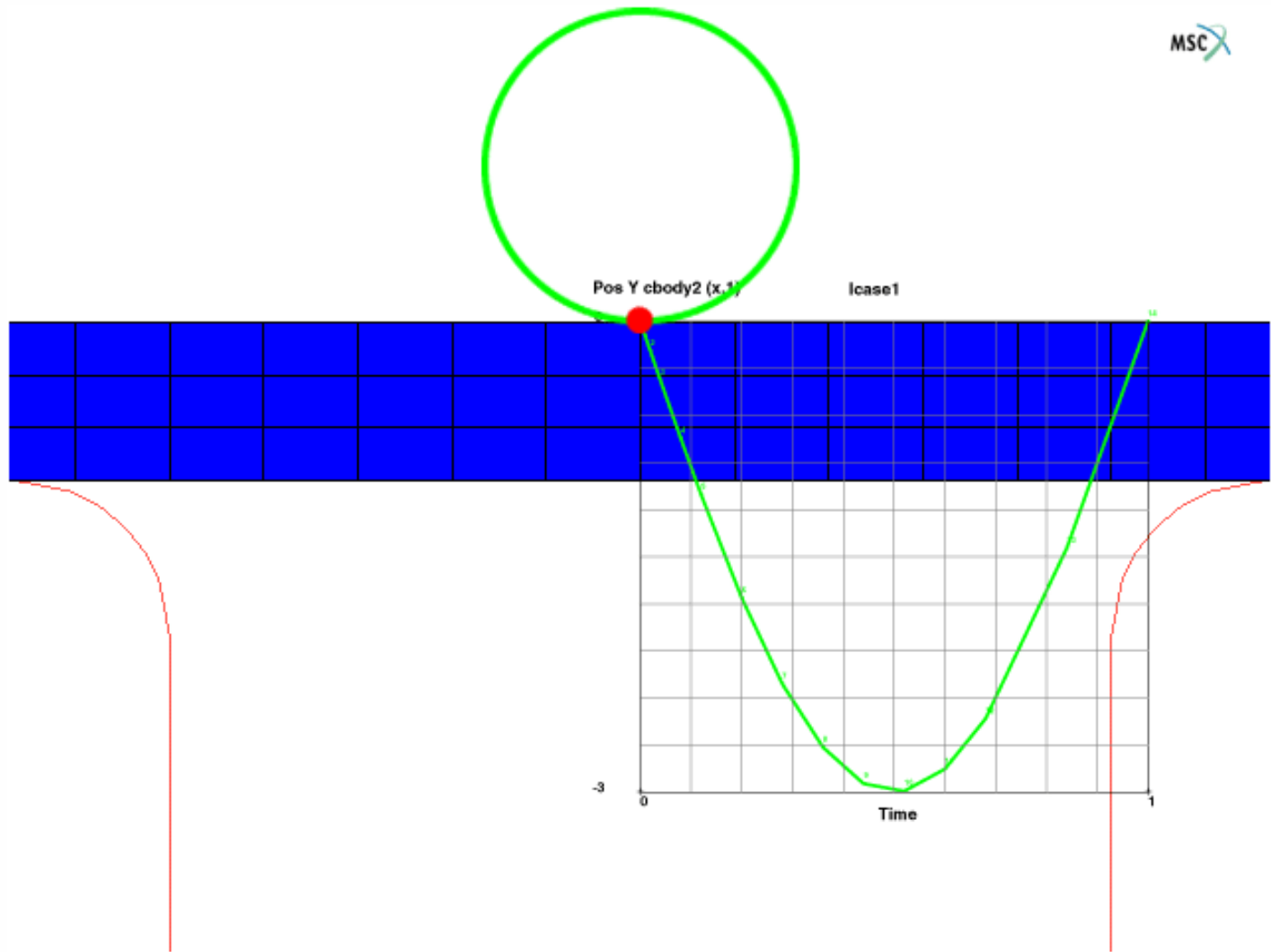
- CONTACT BODIES:** Includes buttons for NEW, REM, COPY, PREV, NEXT, and EDIT. The NAME is set to "Punch".
- CONTACT BODY TYPE:** A list of options including DEFORMABLE, RIGID (selected), SYMMETRY, RIGID w HEAT TRANSFER, and ACOUSTIC.
- RIGID BODY:** A sub-panel with MECHANICAL PROPERTIES, BODY CONTROL, VELOCITY, POSITION, and LOAD, each with a PARAMETERS button.
- POSITION CONTROL:** A table for defining the position (CENTER OF ROTATION) for X, Y, and Z axes. The Y-axis is set to 1 and linked to a table named "PunchPosition".
- TABLES:** A panel for defining tables, with a "TABLES" button.
- JOB PARAMETERS:** A panel with INPUT FILE, DEFAULT STYLE, NEW-STYLE TABLES (selected), and EXTENDED PRECISION INPUT FILE.
- Graph:** A graph titled "PunchPosition" showing a parabolic curve. The vertical axis is labeled "F(x,t)" and the horizontal axis is labeled "v1". The curve starts at (0,0), reaches a minimum at v1, and ends at (1,0).
- Formula Editor:** A panel with DATA POINTS, FORMULA, and buttons for ENTER, REEVALUATE, and CLEAR. The formula entered is $-3 \cdot \sin(\pi \cdot v1)$.
- Bottom Panel:** A row of utility buttons including UNDO, SAVE, DRAW, FILL, RESET VIEW, TX+, TY+, TZ+, RX+, RY+, RZ+, ZOOM IN, SHORTCUTS, UTILS, FILES, PLOT, VIEW, DYN. MODEL, TX-, TY-, TZ-, RX-, RY-, RZ-, ZOOM BOX, OUT, and HELP.

At the bottom of the window, there is a command line with the following text:

```
Enter font name : ANSL_VAR_FONT  
Enter font name : *contact_rigid  
Enter font name : *contact_option control:position  
Command > |
```

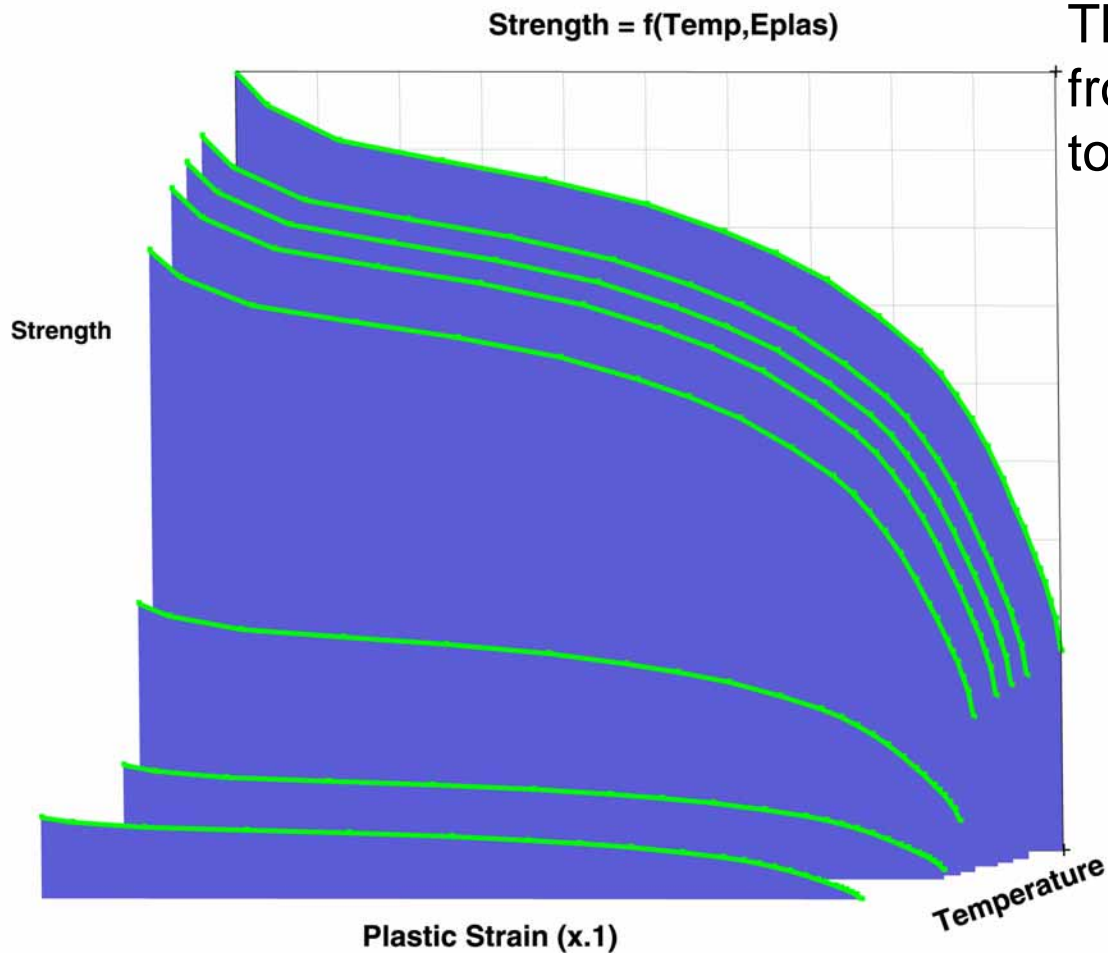
The status bar at the bottom right indicates "Ready".

Table Input - Contact



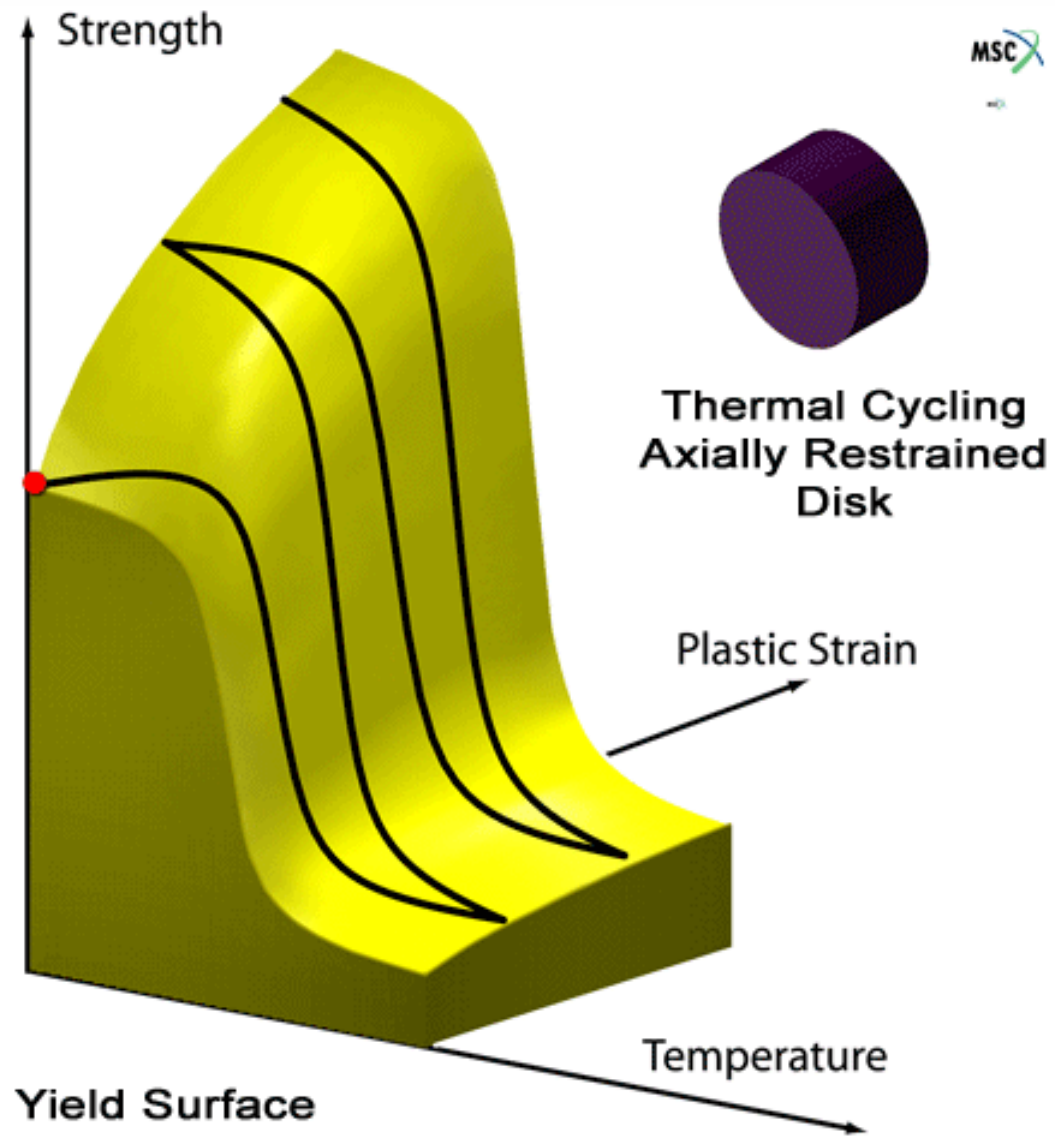
PRODUCT DEVELOPMENT CONFERENCE

2D Table For Yield Surface



The yield surface is created from two curves multiplied together

2D Table For Yield Surface



During plastic flow every integration point must be on the yield surface (follow the red dot)

The disk is cycled from cold to hot two times

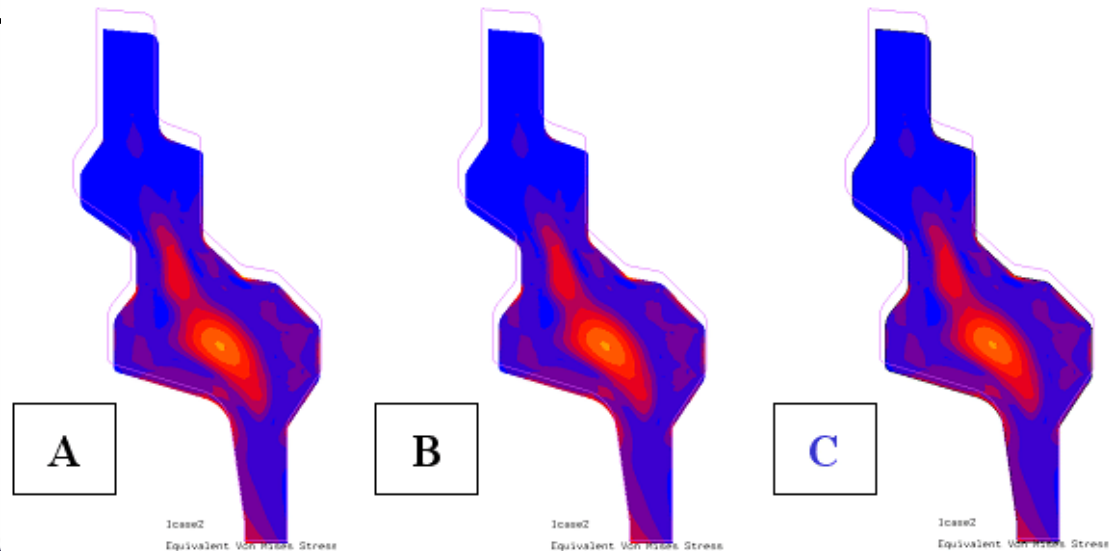
Disk Quench @ Pratt & Whitney

Quenching Simulation using User Sub Wkslp Versus New Table Input for Stress(plastic strain, strain rate, temperature) Data

	MSC.Marc 2001		AF_flowmat		MSC.Marc 2003r2	
	WKSLP		AF_flowmat		■ New Table Input	
	Simulation A		Simulation B		Simulation C	
	wall time	cpu time	wall time	cpu time	wall time	cpu time
total time for input:	1.43	1.18	1.81	1.14	3.12	2.15
total time for stiffness assembly:	853.33	809.39	740.63	722.20	632.68	603.78
total time for stress recovery:	805.06	769.54	714.99	700.82	589.32	567.55
total time for matrix solution:	167.69	149.39	164.97	148.59	172.81	150.07
total time for output:	304.51	284.40	58.70	48.46	56.20	46.73
total time for miscellaneous:	109.15	86.03	112.22	88.74	118.91	85.34

total time:

Run time for C was significantly faster due to faster stiffness formation and stress recovery by using the new table input, and other performance enhancements in Marc2003



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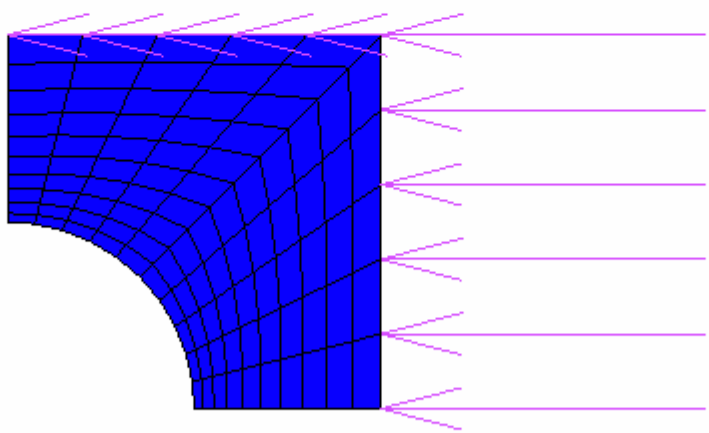
Global Local Zooming

MSC Marc Mentat 2005 Beta 1 changelist #22414 (32bit) (OpenGL): 3dplatecoarselocal.mud

GENERAL BC's
NEW REM
NAME apply3
COPY PREV NEXT EDIT
BOUNDARY CONDITION TYPE
+ GLOBAL-LOCAL

GLOBAL-LOCAL
CONNECT NODES TO GLOBAL MODE
GLOBAL MODEL
POST FILE NATIVE CLEAR
3dplatecoarse_job1.t16
BEYOND POST FILE TIME RANGE STOP
NODE LOCATION TOLERANCE 0.05
CLEAR OK

TABLES
NODES ADD REM 22
POINTS ADD REM 0
CURVES ADD REM 0
SURFACES ADD REM 0
ALL SELECT VISIB OUTLIN
EXIST UNSEL INVIS SURFAC
SELECT SET END LIST (#)
RETURN MAIN



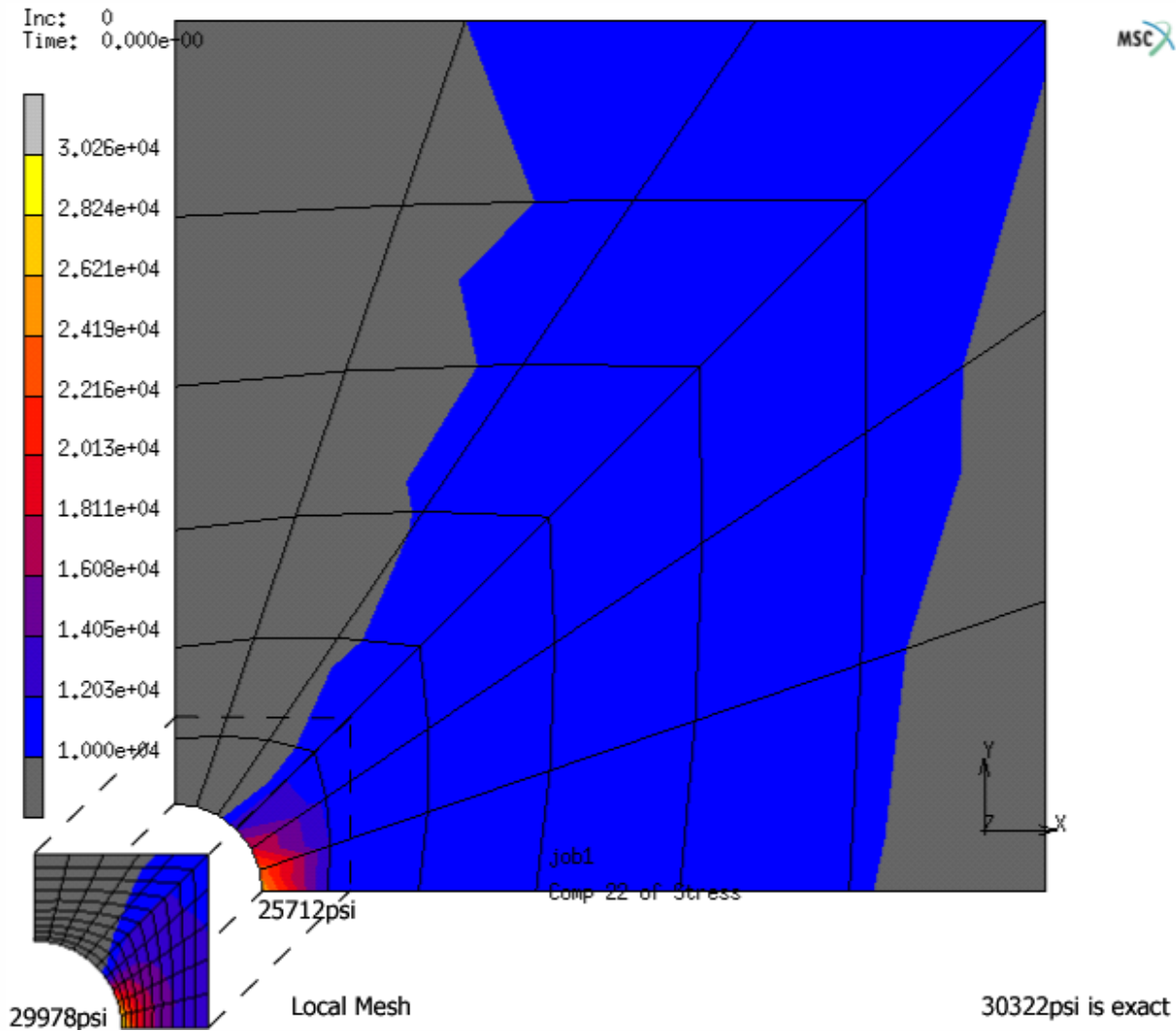
Y
Z X

1

UNDO SAVE DRAW FILL RESET VIEW TX+ TY+ TZ+ RX+ RY+ RZ+ ZOOM IN SHORTCUTS
UTILS FILES PLOT VIEW DYN MODEL TX- TY- TZ- RX- RY- RZ- BOX OUT HELP

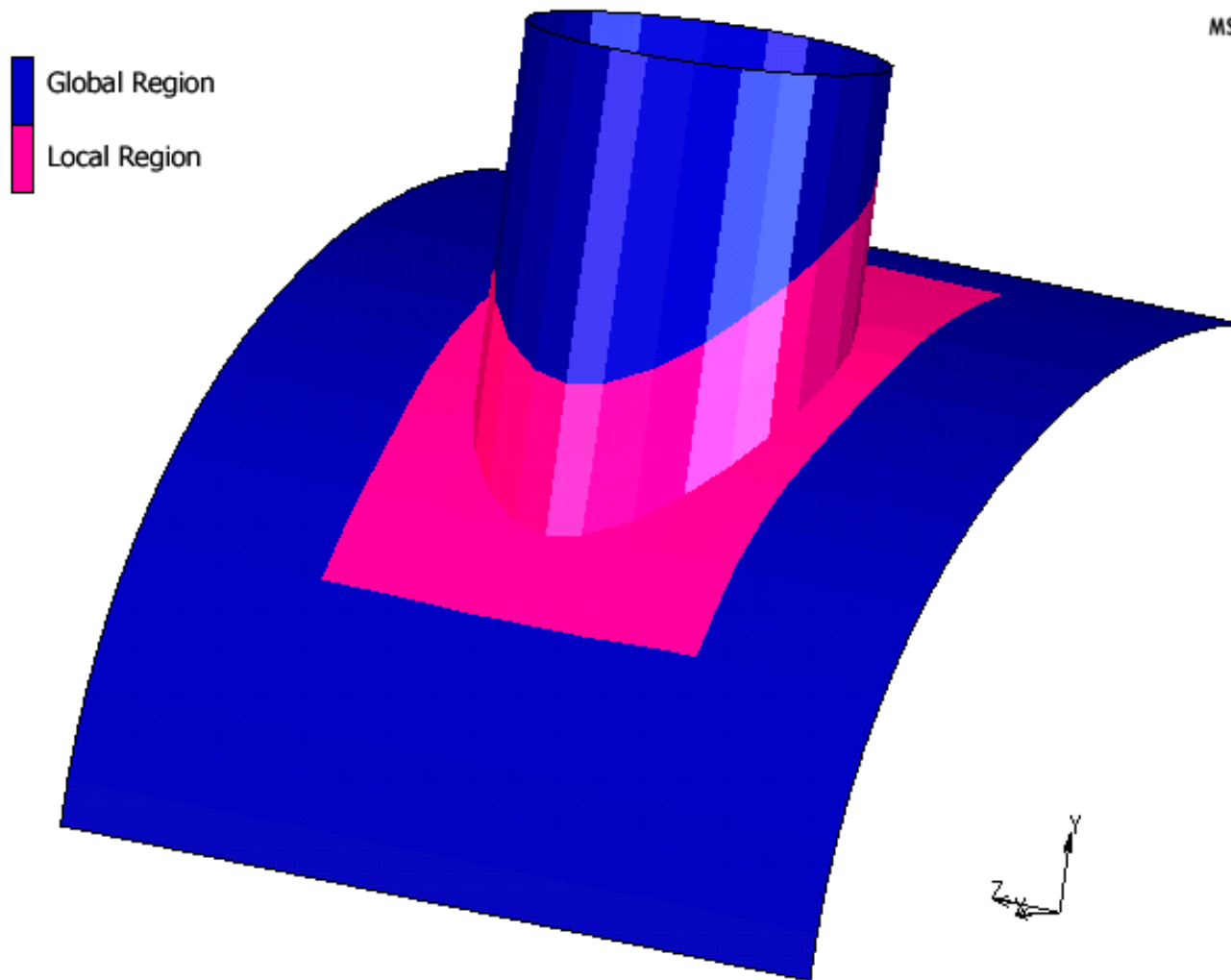
Command > *dynamic_model_on
Command > *apply_type global_local Ready
Command > *apply_type global_local
Command > █

Global Local Zooming



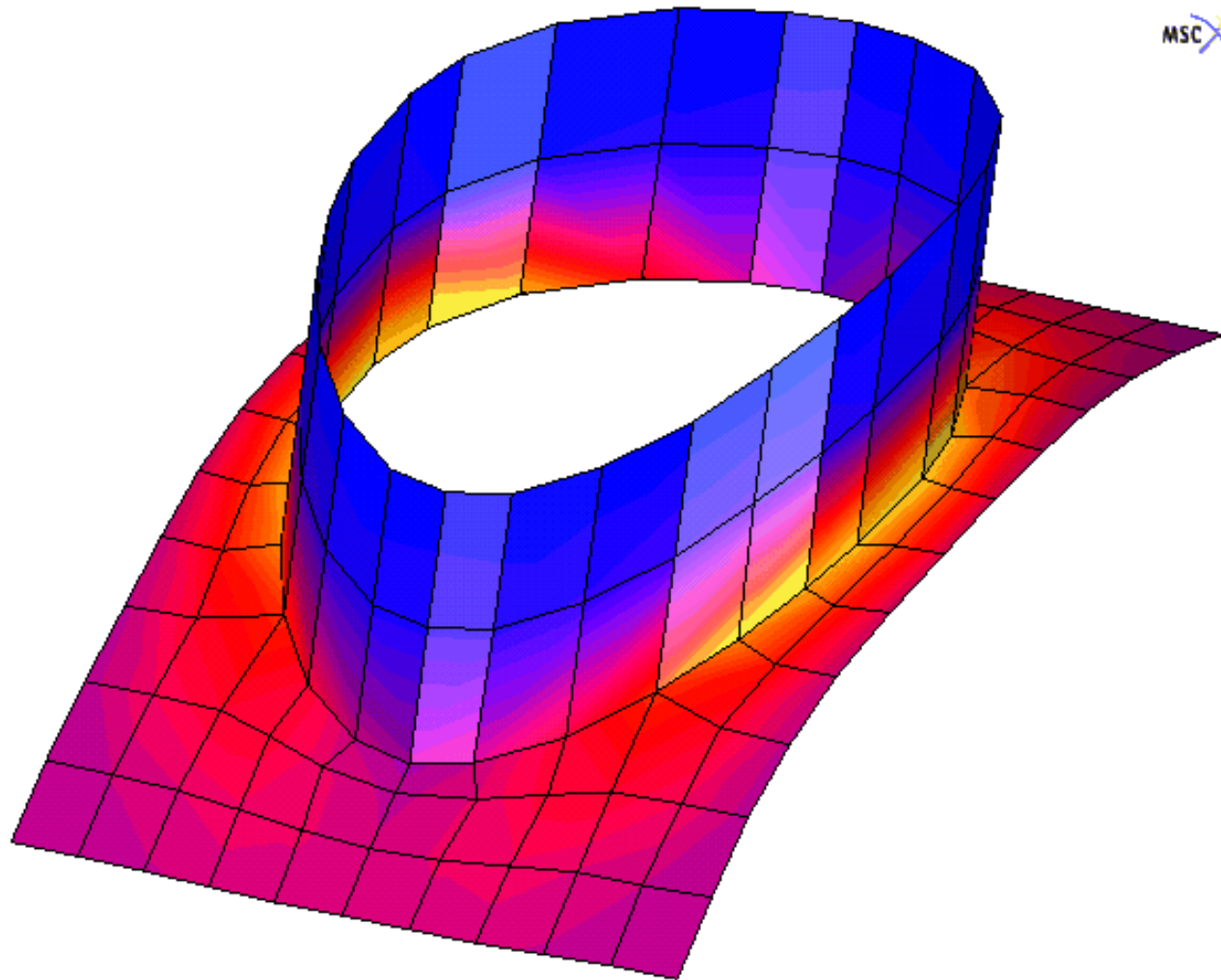
PRODUCT DEVELOPMENT CONFERENCE **More...**

Global Local Zooming

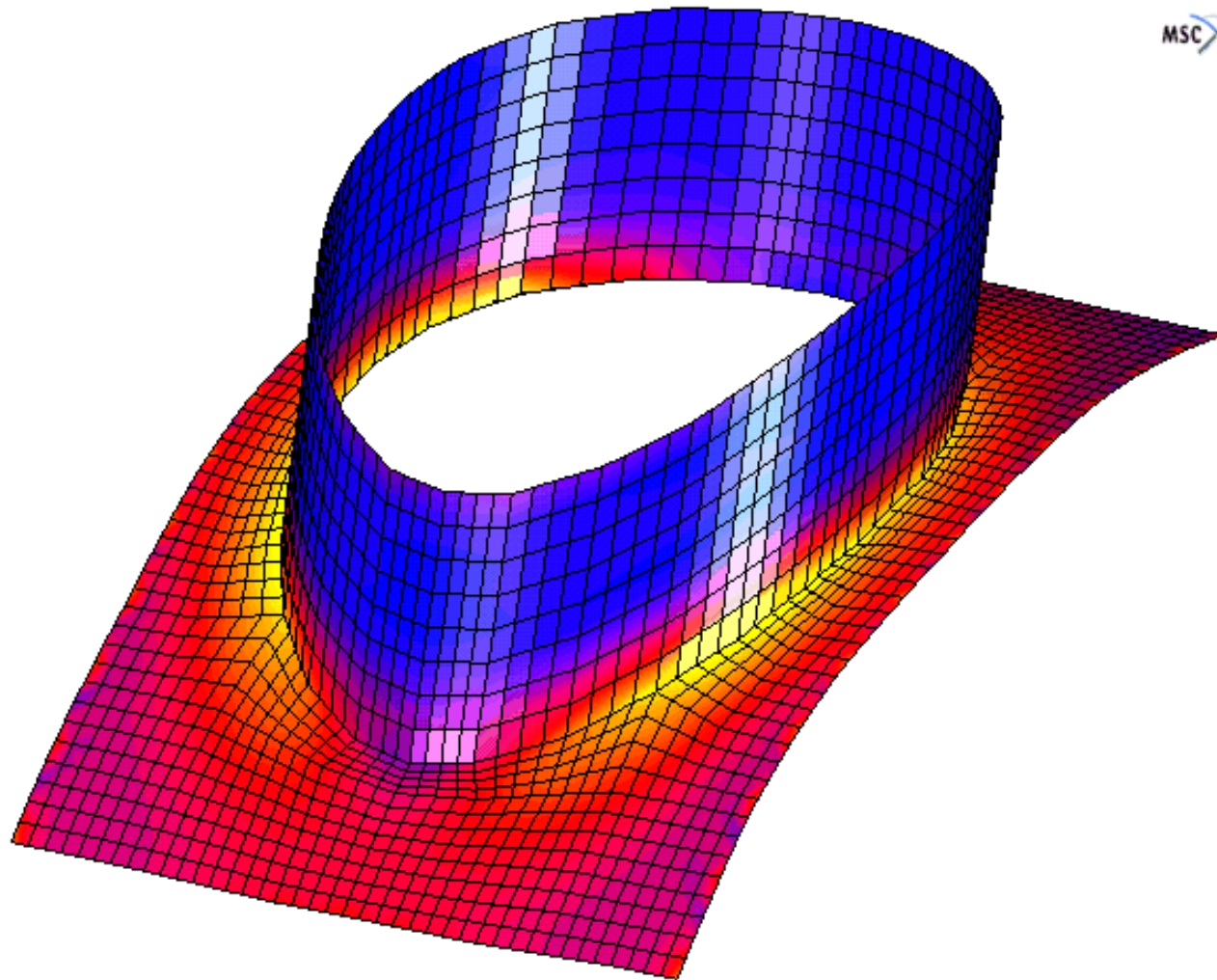


PRODUCT DEVELOPMENT CONFERENCE

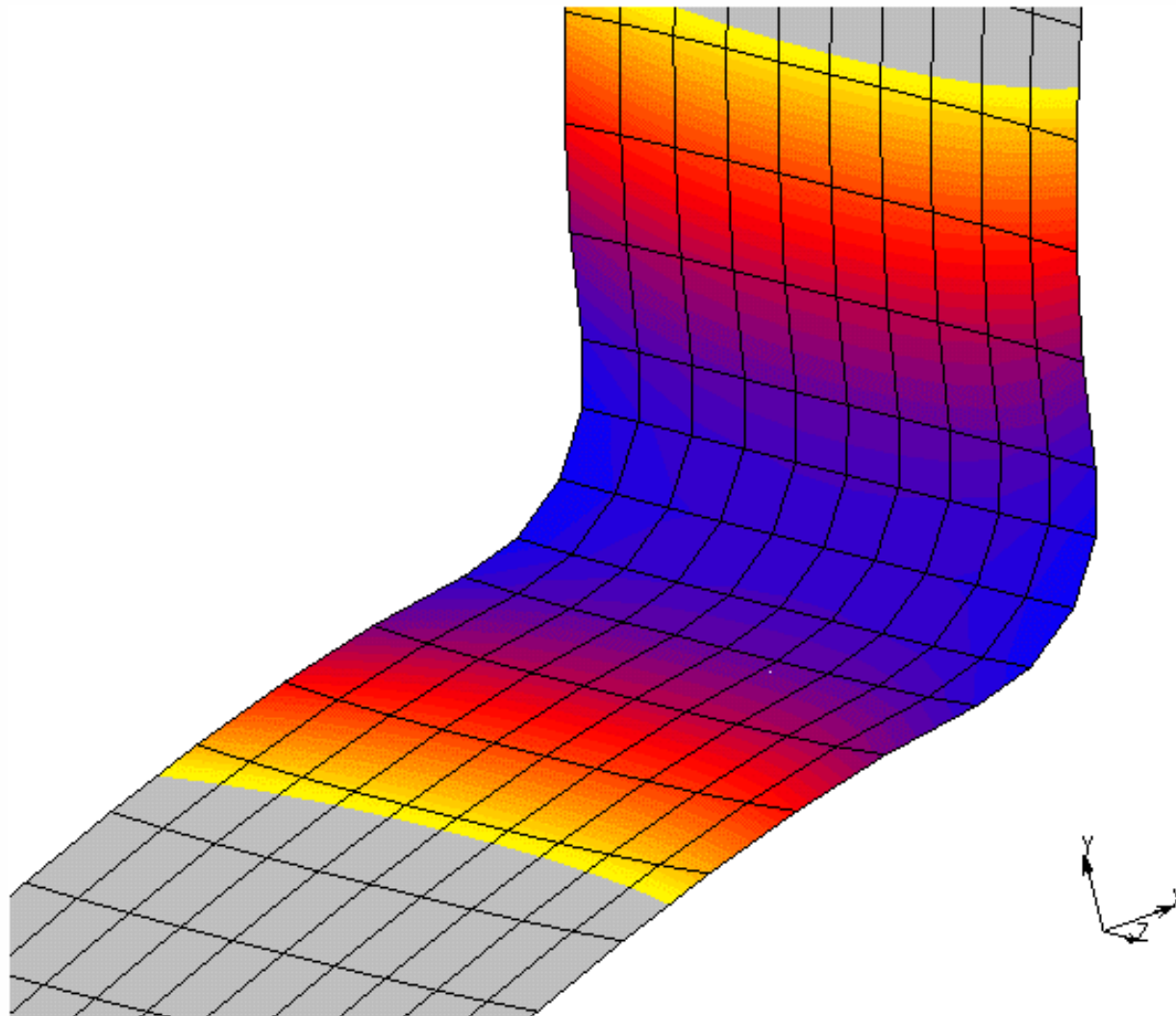
Local Region of Global Mesh



Local Mesh



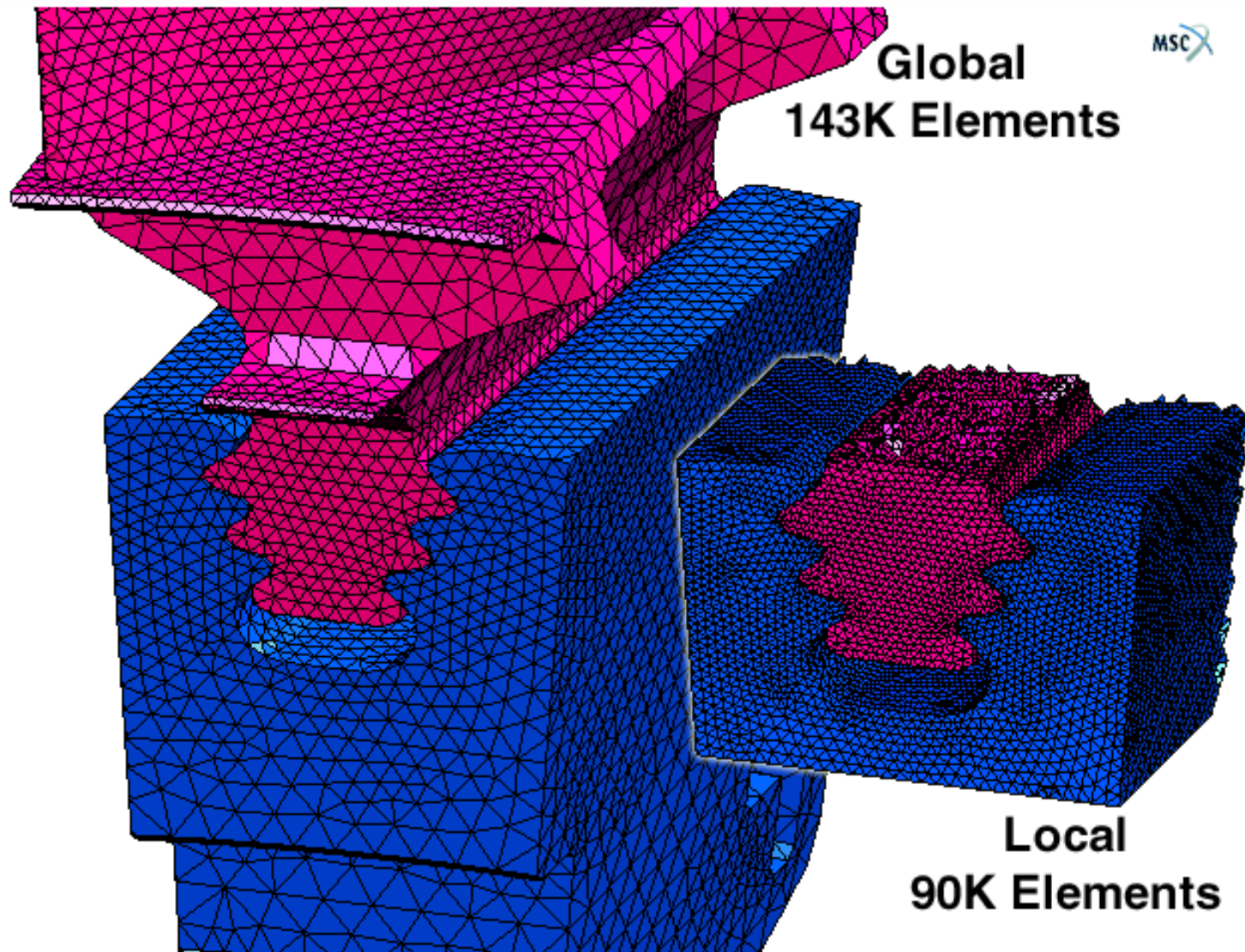
Shell 2 Brick Zoom



MSC

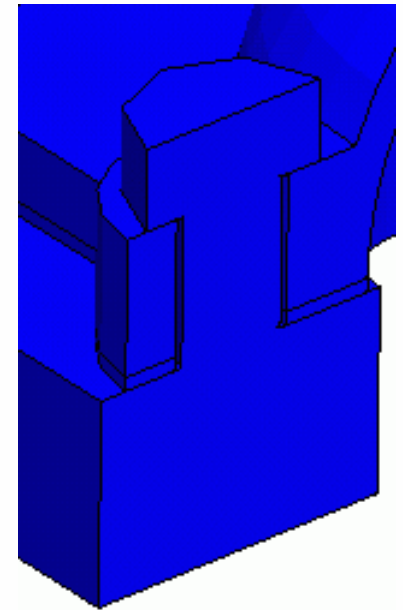
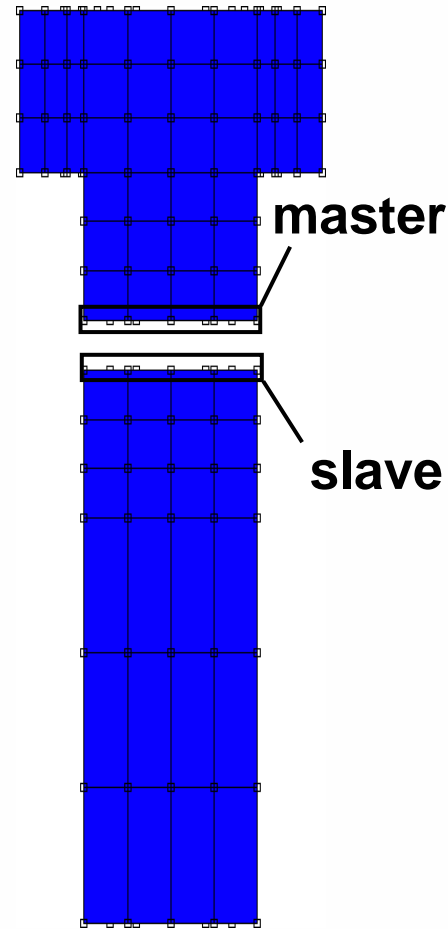
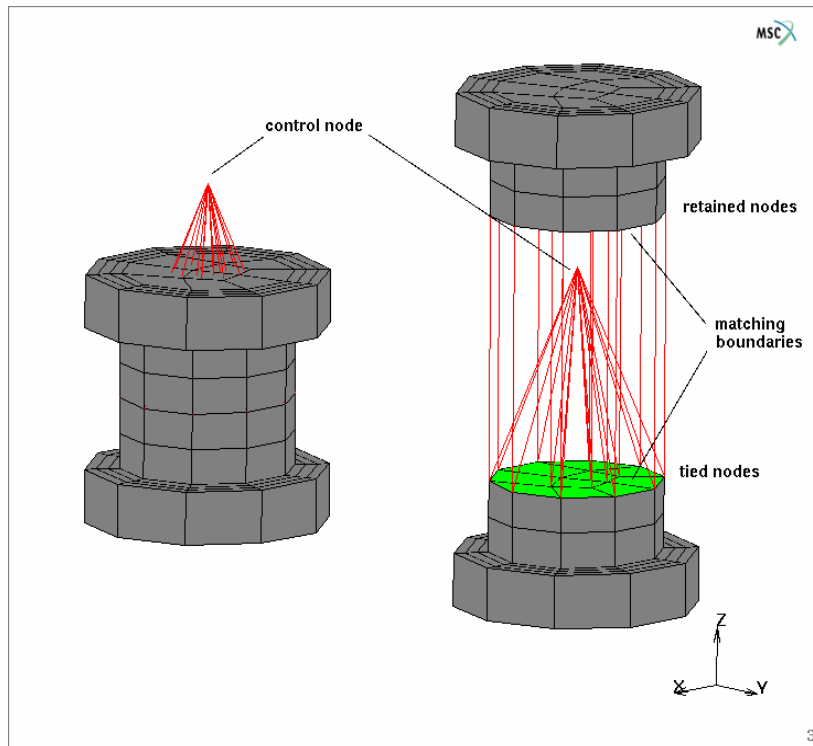
PRODUCT DEVELOPMENT CONFERENCE

Zoom In On Existing Models



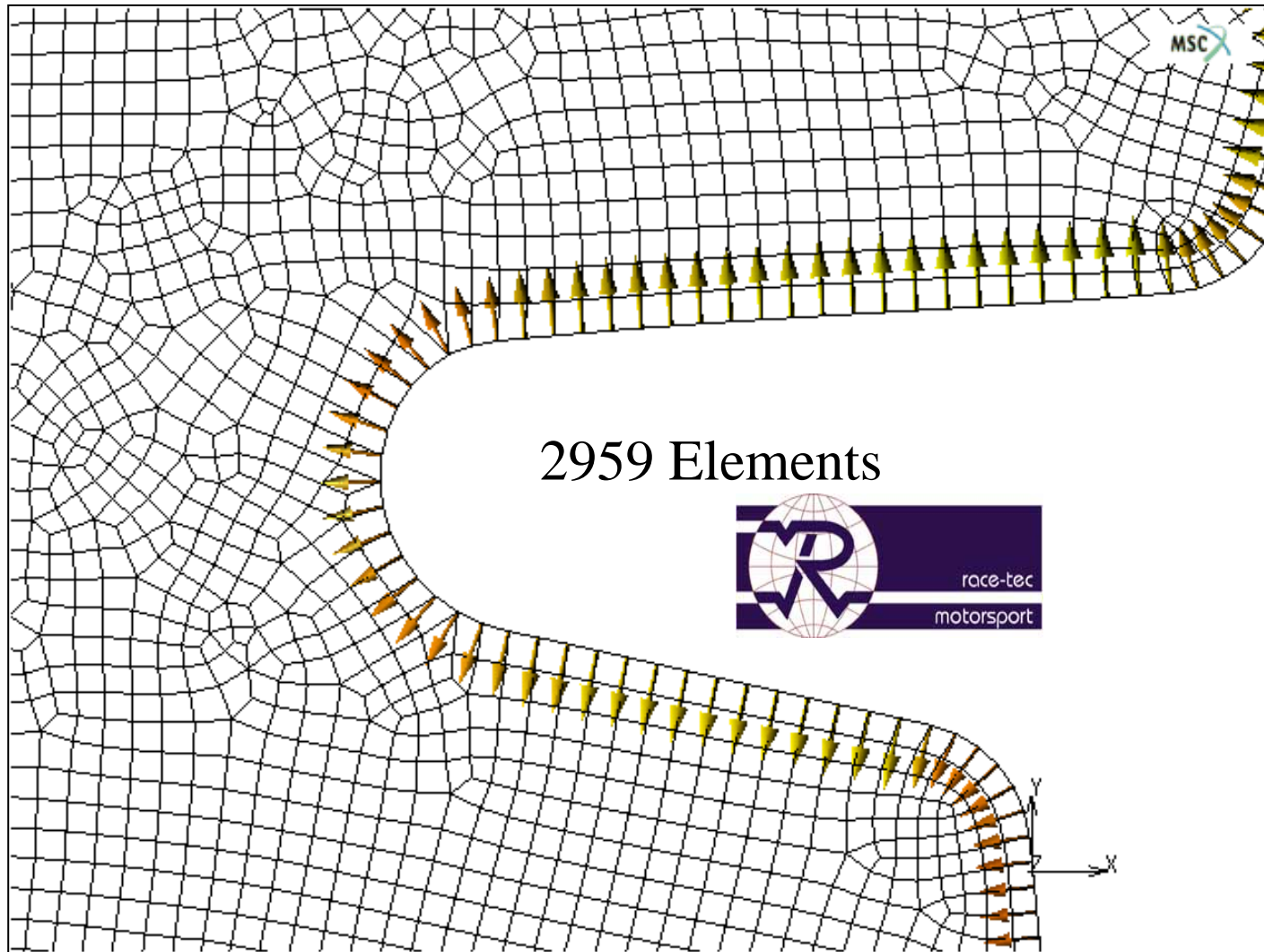
Bolt Modeling - Engine

Automatically splits into two parts
and generates constraints

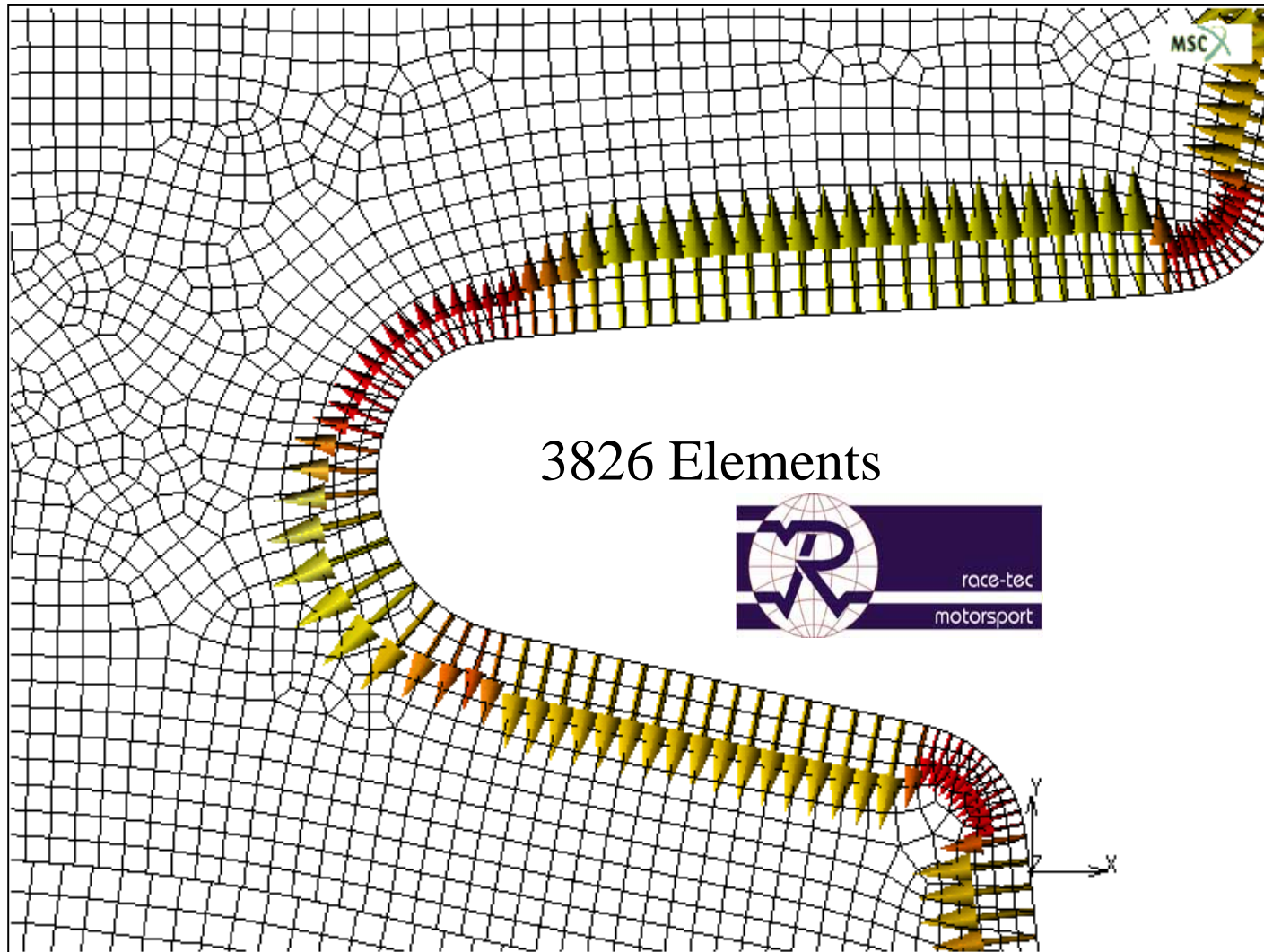


More... PRODUCT DEVELOPMENT CONFERENCE

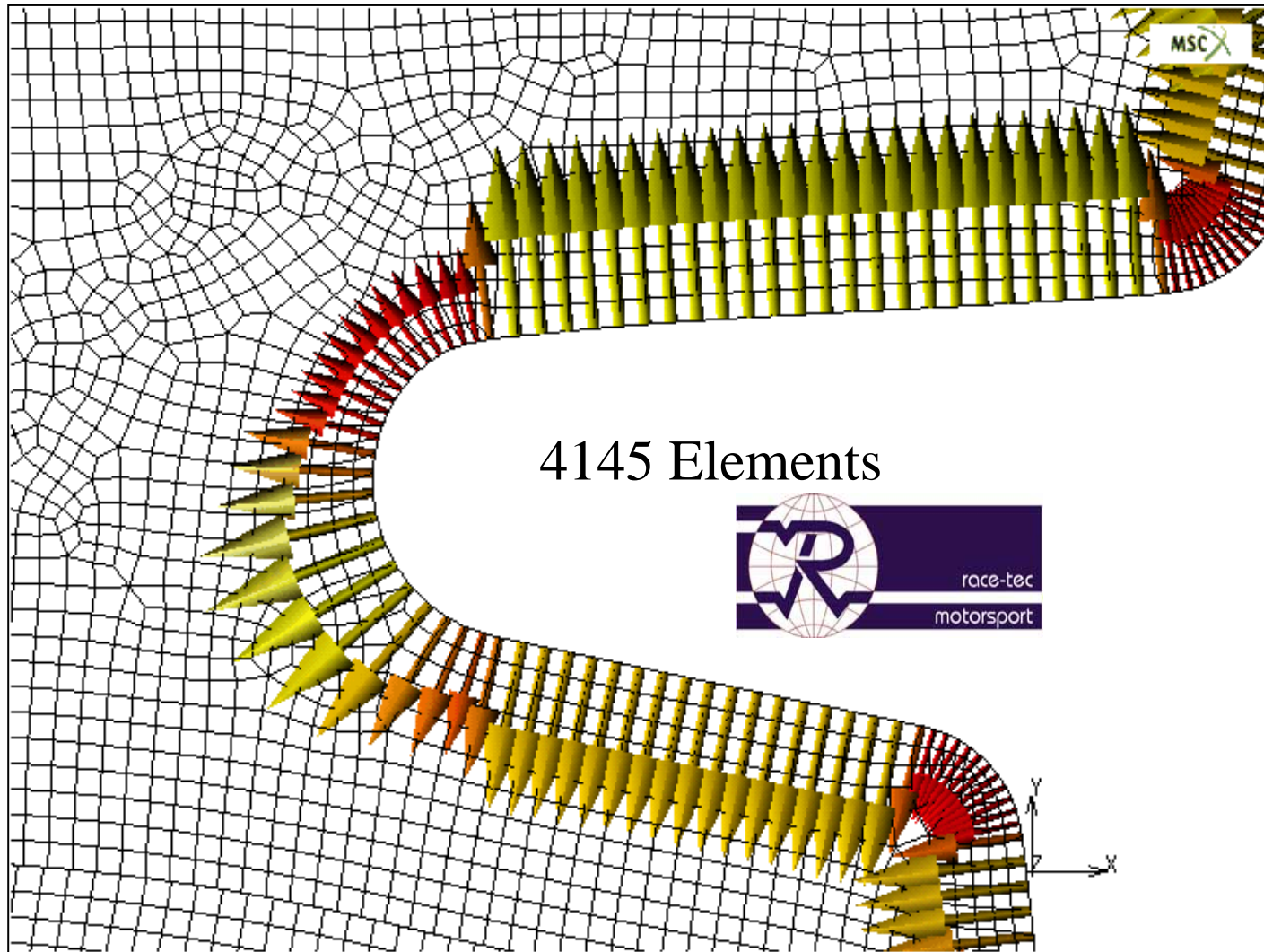
Remeshing With Pressure BC



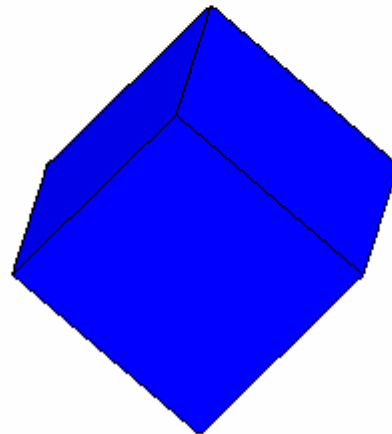
Remeshing With Pressure BC



Remeshing With Pressure BC

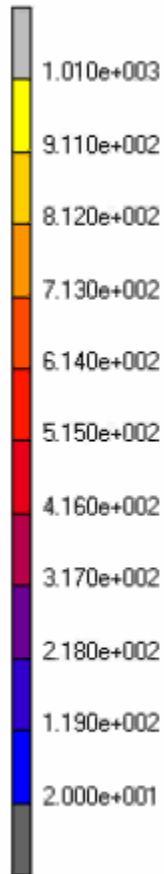


Remeshing Cube Crush



Remeshing Glass Forming

Inc: 0
Time: 0.000e+000



Glass Forming
Temperature

PRODUCT DEVELOPMENT CONFERENCE ¹

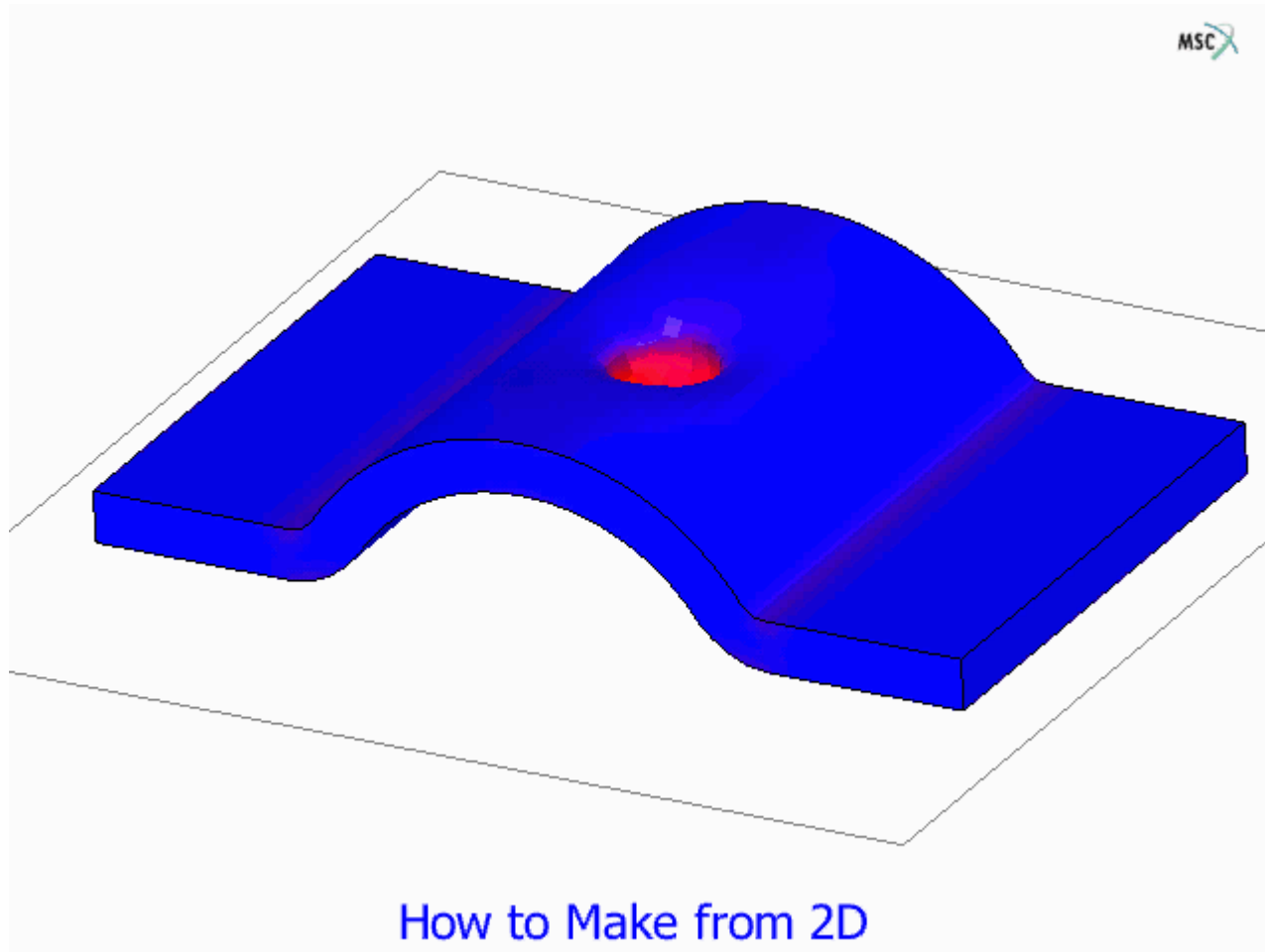
Pre-State Option

Prior Results Transfer as Initial Conditions in a New Model
which includes:

- 2D to 2-D
- 2-D plane strain to 3-D
- 2-D axisymmetric to 3-D
- 2-D generalized plane strain to 3-D
- 3-D to 3-D

Pre-State Option

Pre-State Option = Past Residuals Become Initial State



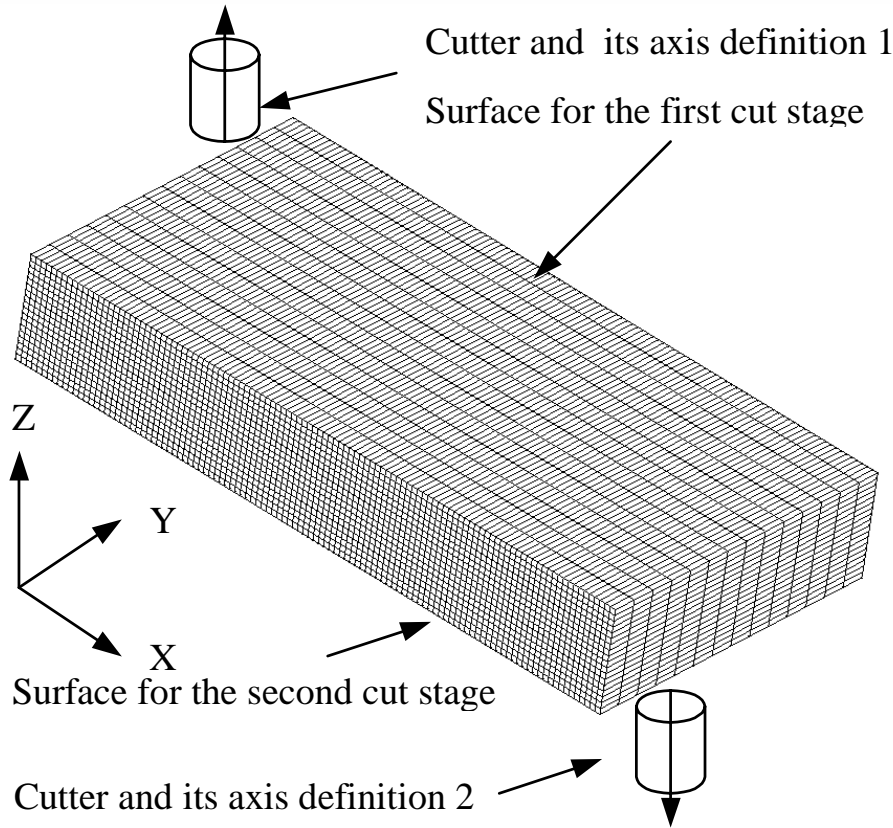
How to Make from 2D

PRODUCT DEVELOPMENT CONFERENCE

Cutting

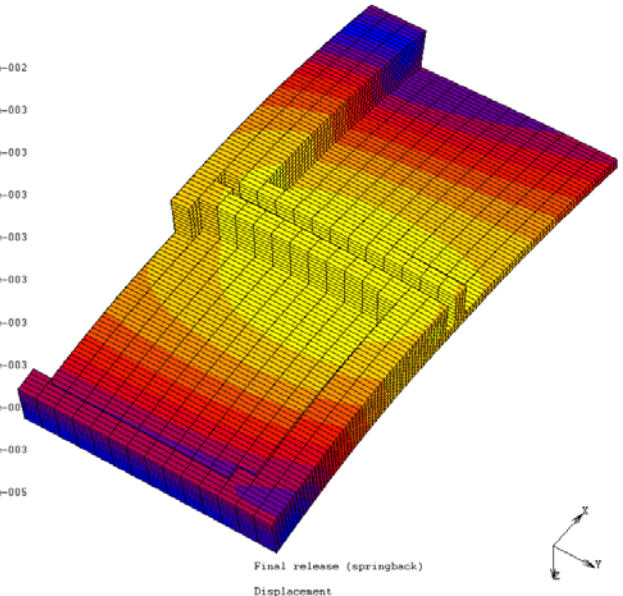
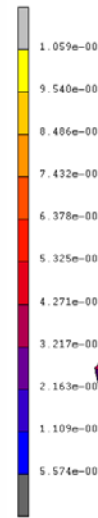
Pocket Cutting

- Definition of the Two Cutting Processes



Inc: 794
Time: 8.110e+001

MSC



Cutting – 737 Wedgetail



PRODUCT DEVELOPMENT CONFERENCE

Welding

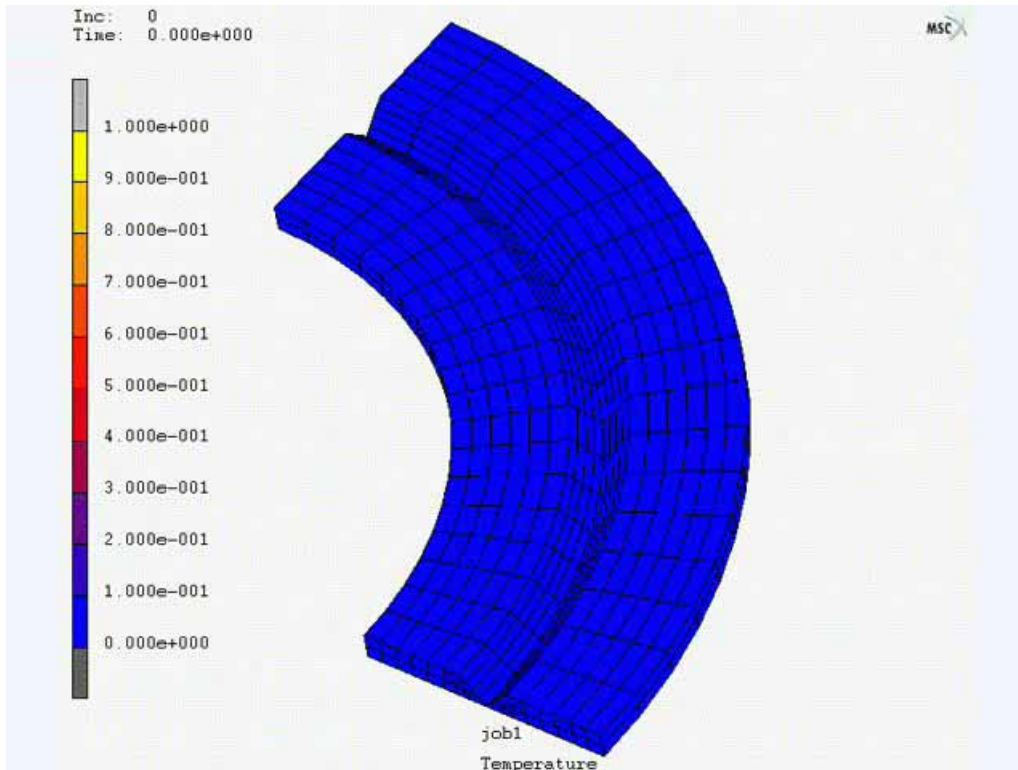
Weld Heat Source Definition

- Size, shape, magnitude, velocity

Weld Heat Source Motion

- Path, Orientation

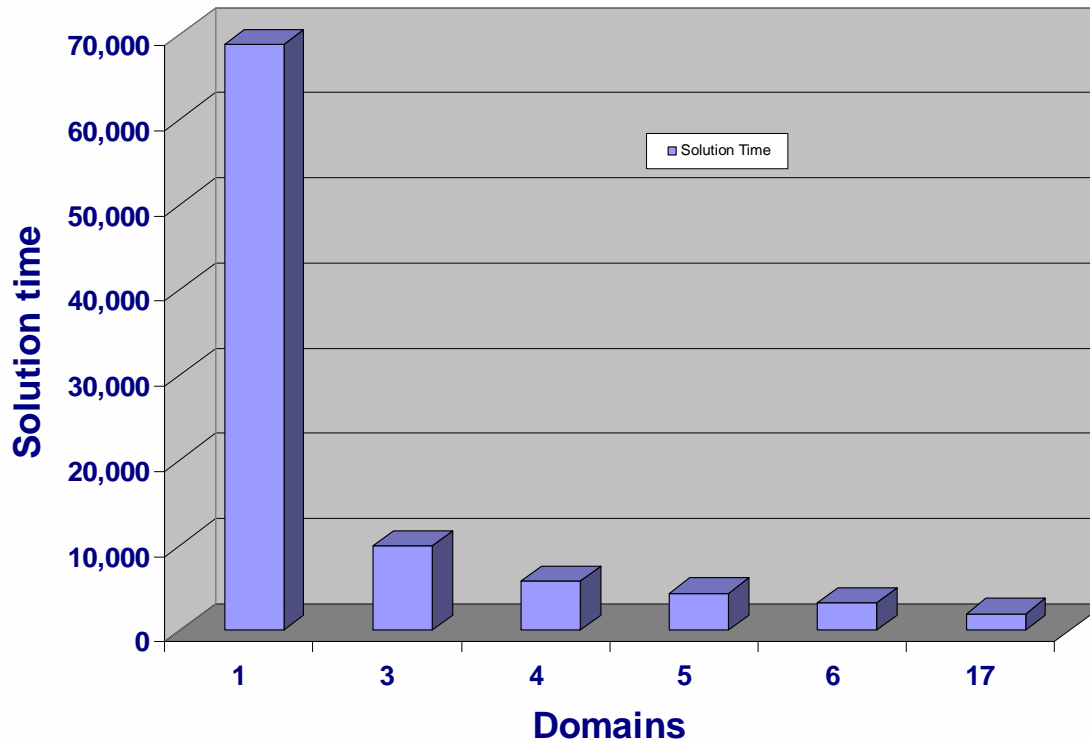
Filler Elements Modeling



Parallel Case Study Results

Flexible Bearing Results

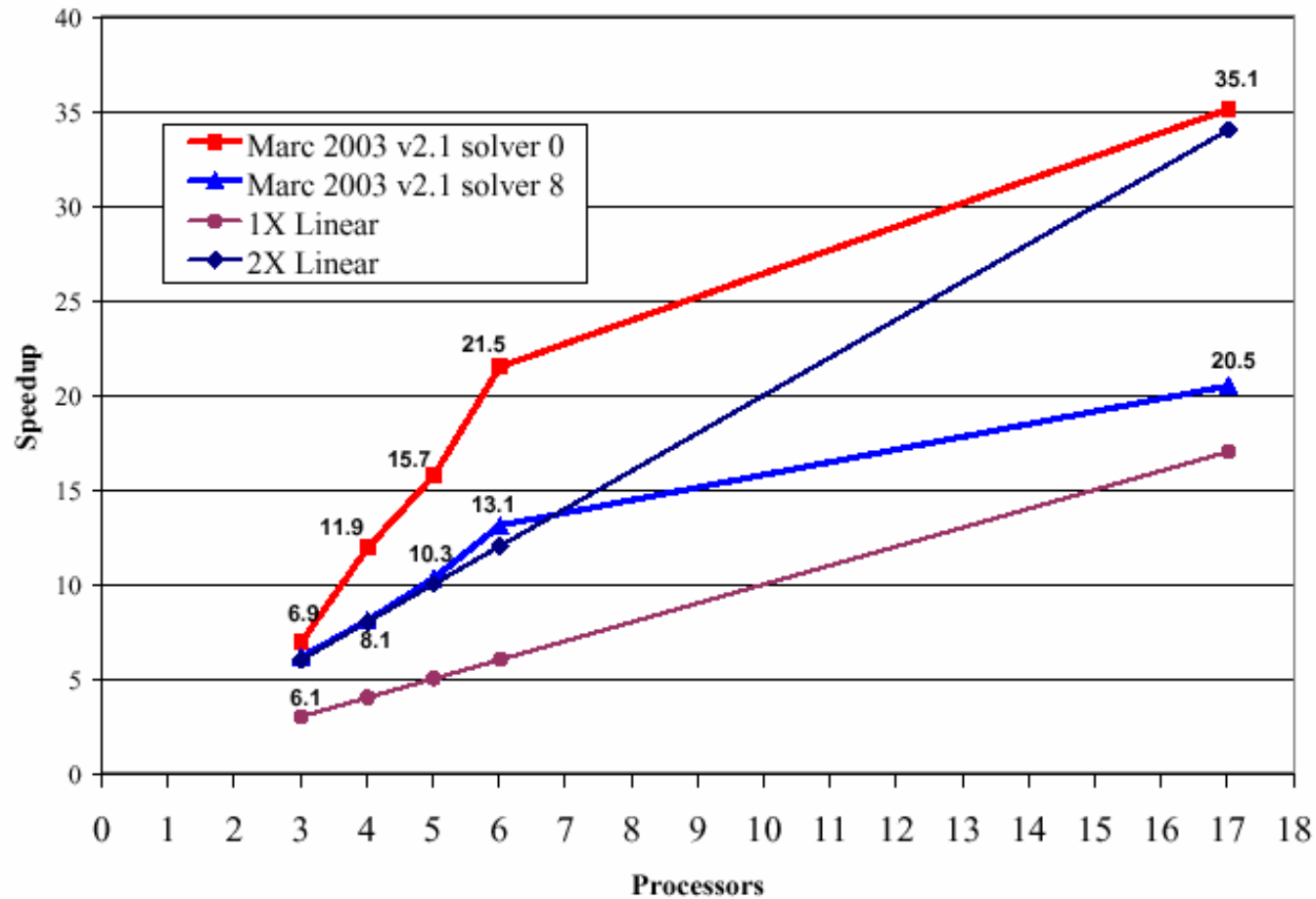
Solver 8, Optimize 11



Note: These results reflect the preconditioner improvements as well as the non-linear acceleration procedure

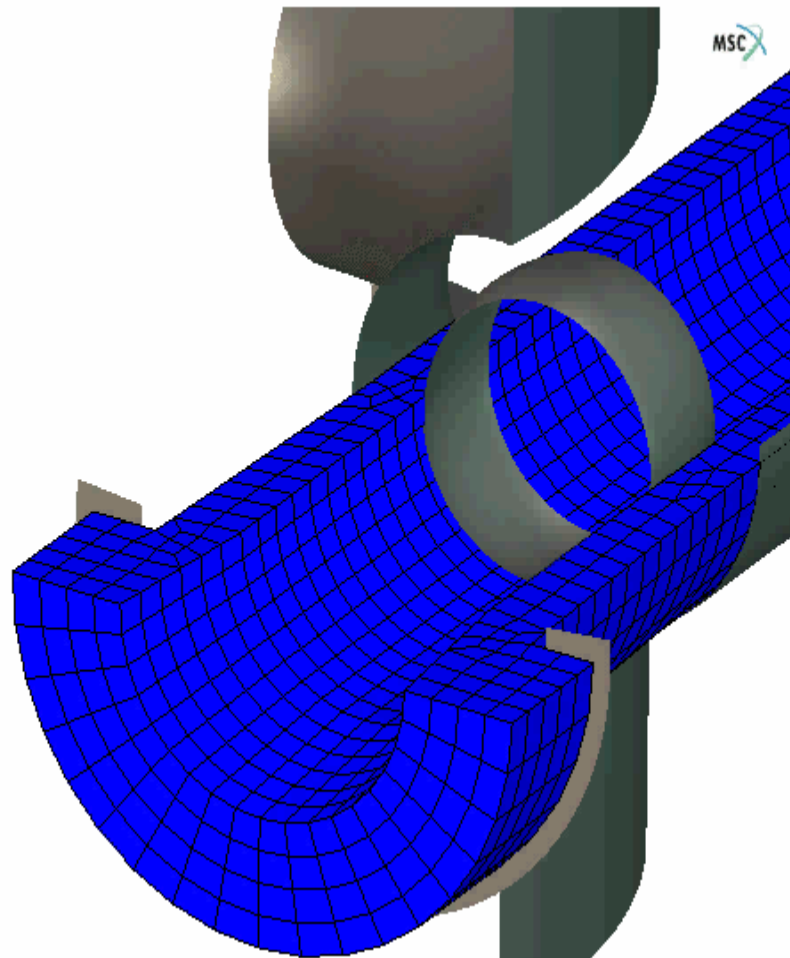
Parallel Case Study Results

(All Objectives met and/or exceeded)



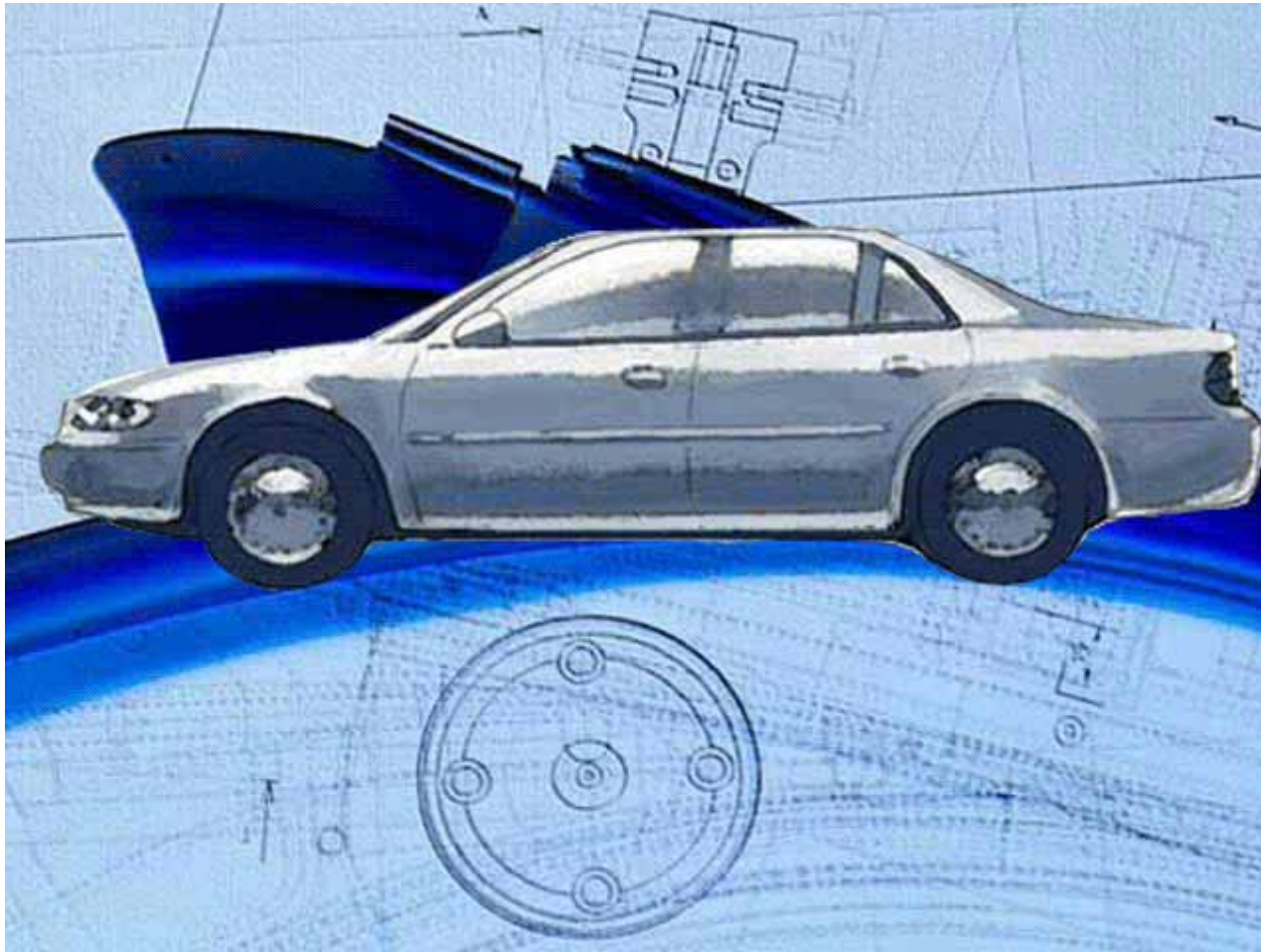
Parallel + Adaptive Meshing

Tube bend with single input file



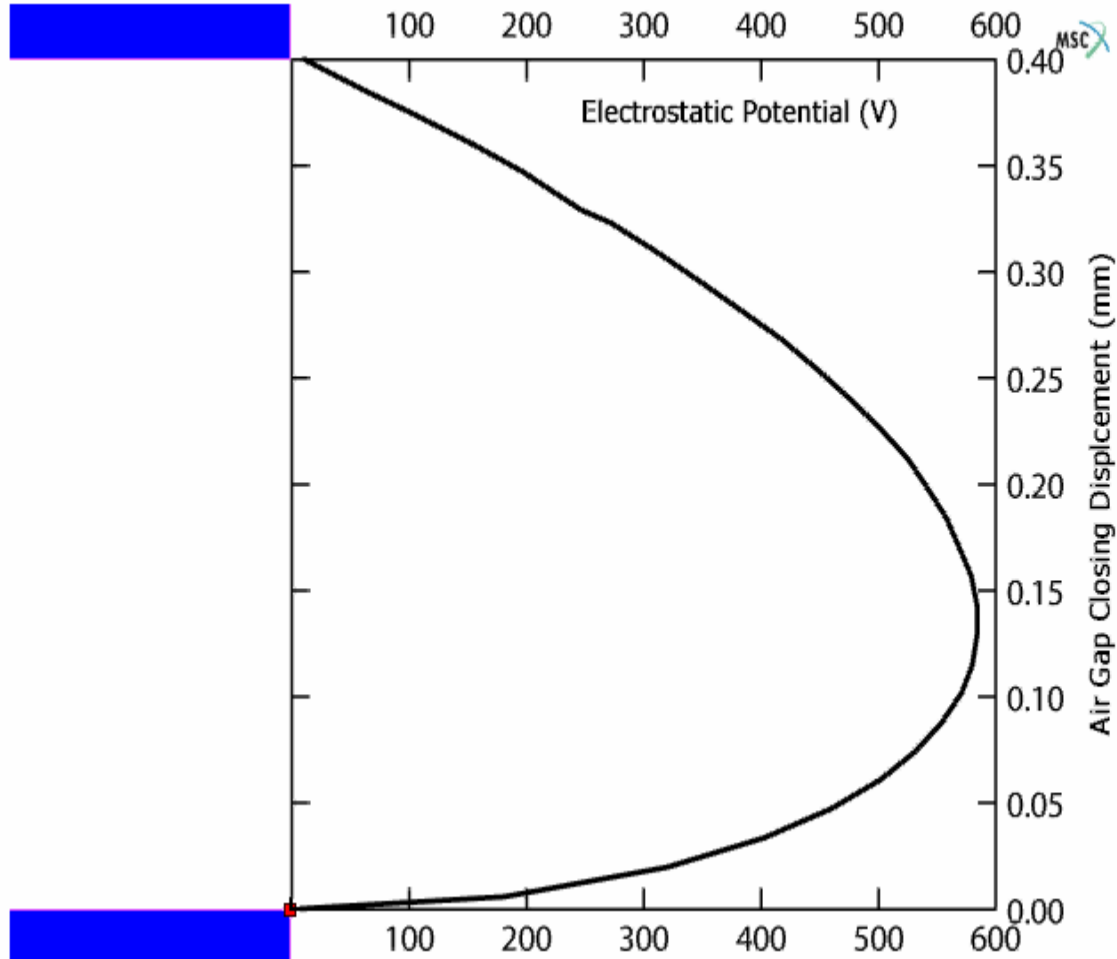
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Generalized Strain Energy



PRODUCT DEVELOPMENT CONFERENCE

Electrostatic-Mechanical



PRODUCT DEVELOPMENT CONFERENCE

Solvers Roadmap

V2006 Resource %

