

Workshop - Working with Multiple Subcases and Multi Discipline Optimization

AN MSC NASTRAN SOL 200 TUTORIAL

Optimization Problem Statement

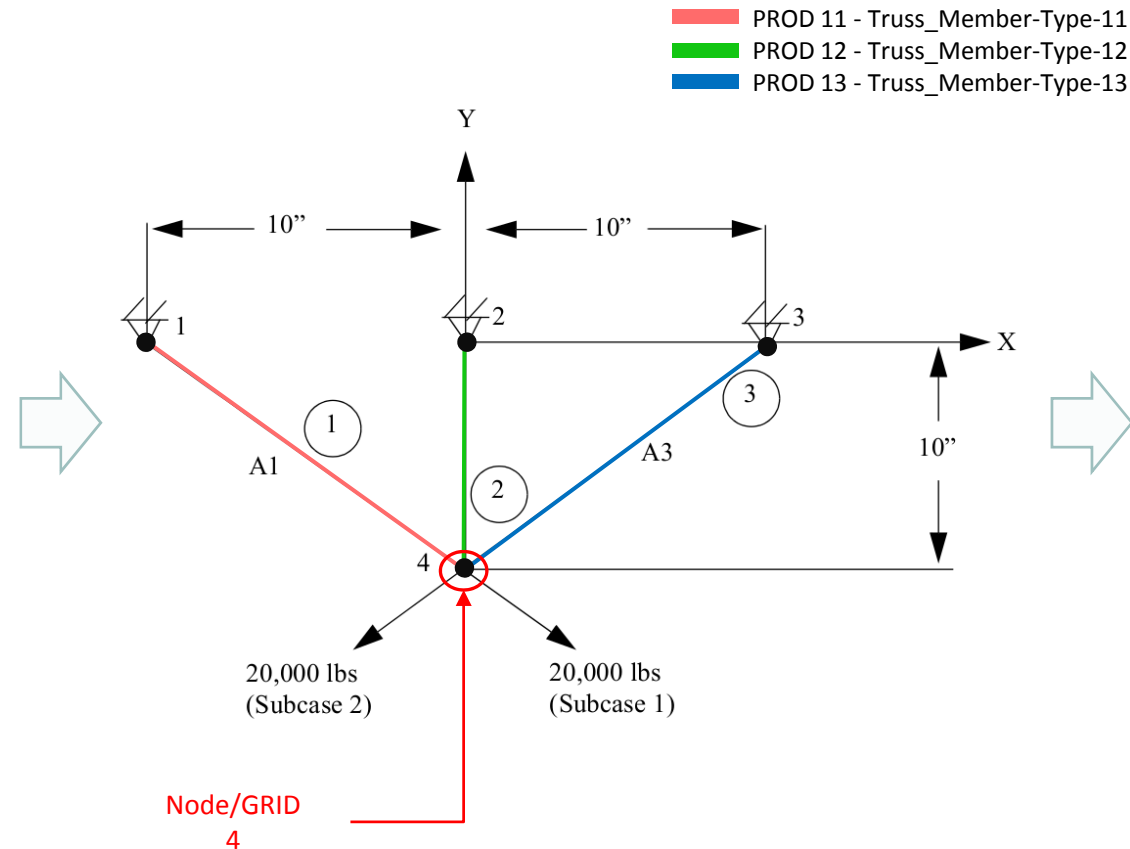
Design Variables

x1: A of PROD 11
x2: A of PROD 12
x3: A of PROD 13

$$.1 < x1, x2, x3 < 100.$$

Variable Link

$$x3 = x1$$



Design Objective

r0: Minimize weight

Design Constraints

r1: Axial stress of elements related to
PROD 11, 12, 13

$$-15000 < r1 < 20000$$

r2: x and y component of displacement for
node 4
























$$-.2 < r2 < .2$$

r3: natural frequency of mode 1
80 Hz < r3

Optimization Problem Statement

Subcase Assignment

This tutorial describes how to assign constraints across different subcases when the analysis types are different. This example deals with a multidiscipline optimization. Subcase 1 corresponds to a normal modes analysis. Subcases 2-20 correspond to statics subcases. Each subcase is assigned constraints.

Status	Label	Response Type	Analysis Type	Description	Global Constraints	SUBCASE 1	SUBCASE 2	SUBCASE 3	SUBCASE 4	SUBCASE 5	SUBCASE 6	SUBCASE 7	SUBCASE 8	SUBCASE 9	SU
	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>											
					Analysis Types →	Normal Modes	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Sta
		r1	DISP	STATICS	T1, T2 component(s) of displacement at grid 4										
		r2	STRESS	STATICS	Stress, item code 2, of elements associated with PROD 11, 12, 13										
		r3	FREQ	MODES	Natural frequency of mode 1										

Contact me

- Nastran SOL 200 training
- Nastran SOL 200 questions
- Structural or mechanical optimization questions
- Access to the SOL 200 Web App

christian@ the-engineering-lab.com

Tutorial

SOL 200 Web App Capabilities

The Post-processor Web App and HDF5 Explorer are free to MSC Nastran users.

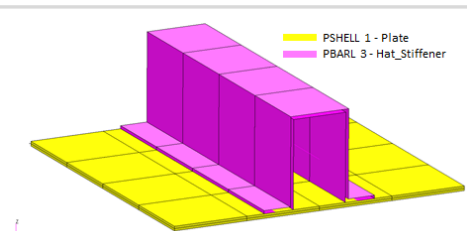
Compatibility

- Google Chrome, Mozilla Firefox or Microsoft Edge
- Windows and Red Hat Linux
- Installable on a company laptop, workstation or server. All data remains within your company.

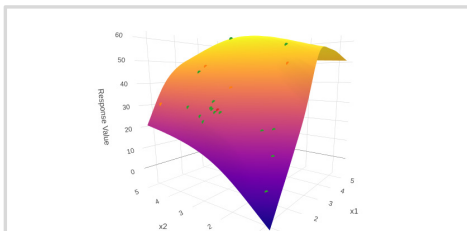
Web Apps

Benefits

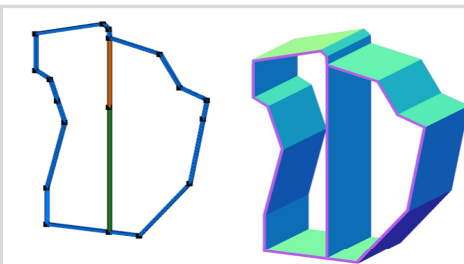
- REAL TIME error detection. 200+ error validations.
- REAL TIME creation of bulk data entries.
- Web browser accessible
- Free Post-processor web apps
- +80 tutorials



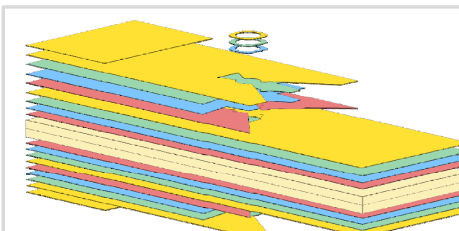
Web Apps for MSC Nastran SOL 200
Pre/post for MSC Nastran SOL 200.
Support for size, topology, topometry, topography, multi-model optimization.



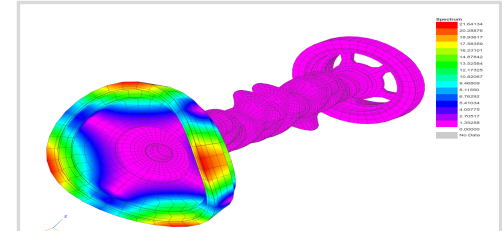
Machine Learning Web App
Bayesian Optimization for nonlinear response optimization (SOL 400)



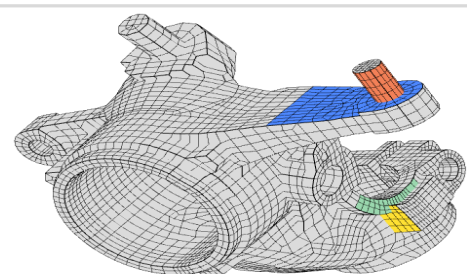
PBMSECT Web App
Generate PBMSECT and PBRSECT entries graphically



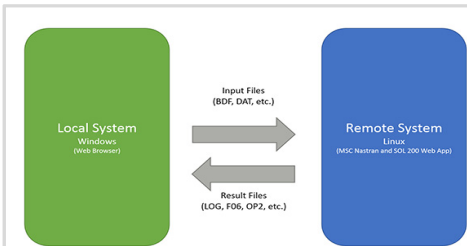
Ply Shape Optimization Web App
Optimize composite ply drop-off locations, and generate new PCOMPG entries



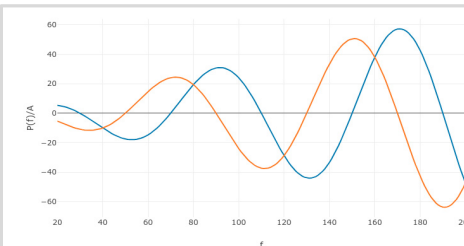
Post-processor Web App
View MSC Nastran results in a web browser on Windows and Linux



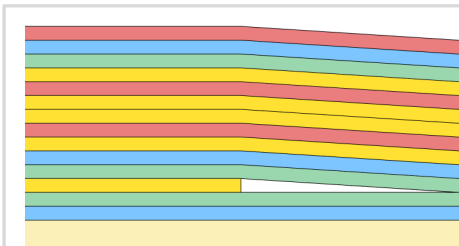
Shape Optimization Web App
Use a web application to configure and perform shape optimization.



Remote Execution Web App
Run MSC Nastran jobs on remote Linux or Windows systems available on the local network



Dynamic Loads Web App
Generate RLOAD1, RLOAD2 and DLOAD entries graphically



Stacking Sequence Web App
Optimize the stacking sequence of composite laminate plies

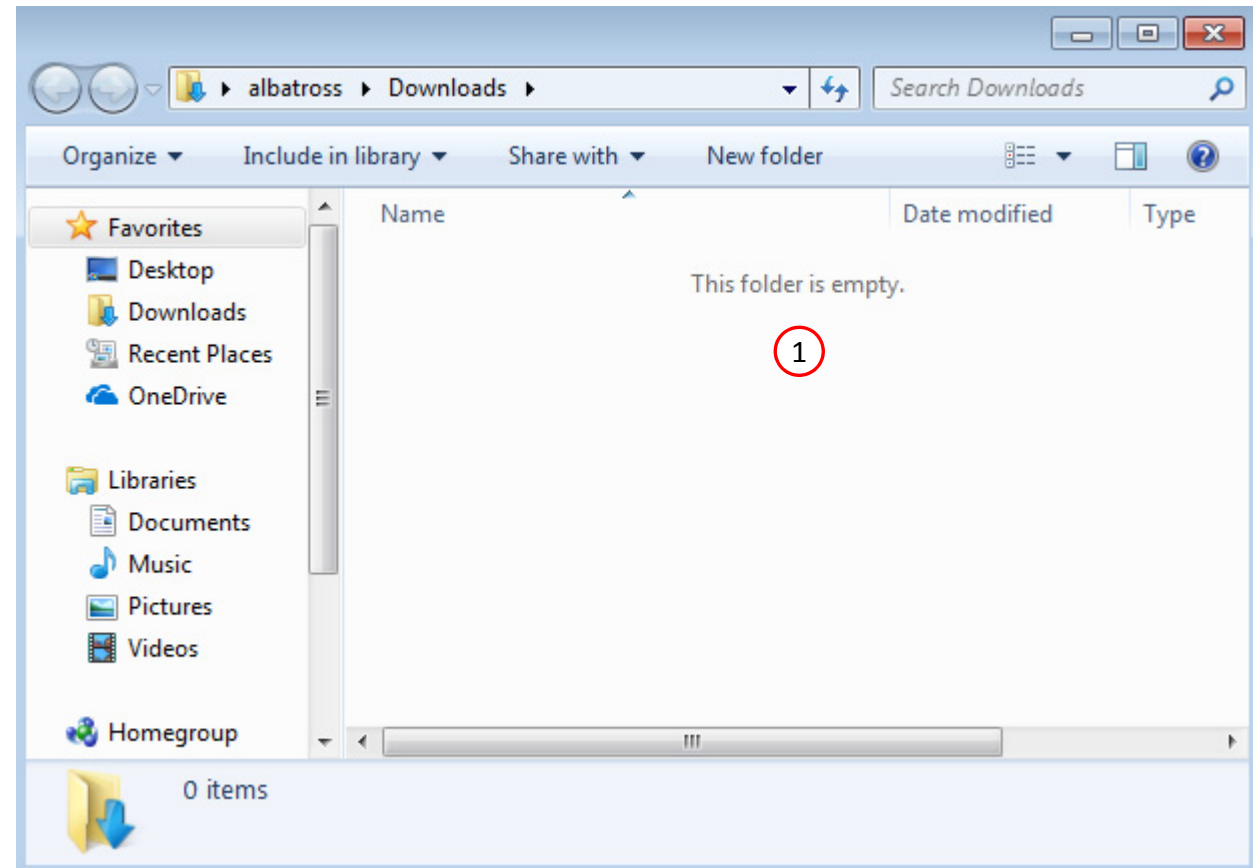


HDF5 Explorer Web App
Create graphs (XY plots) using data from the H5 file

Before Starting

1. Ensure the Downloads directory is empty in order to prevent confusion with other files

- Throughout this workshop, you will be working with multiple file types and directories such as:
 - .bdf/.dat
 - nastran_working_directory
 - .f06, .log, .pch, .h5, etc.
- To minimize confusion with files and folders, it is encouraged to start with a clean directory.



Go to the User's Guide

1. Click on the indicated link

- The necessary BDF files for this tutorial are available in the Tutorials section of the User's Guide.



Obtain Starting Files

1. Find the indicated example
2. Click Link
3. The starting file has been downloaded

- When starting the procedure, all the necessary BDF files must be collected together.



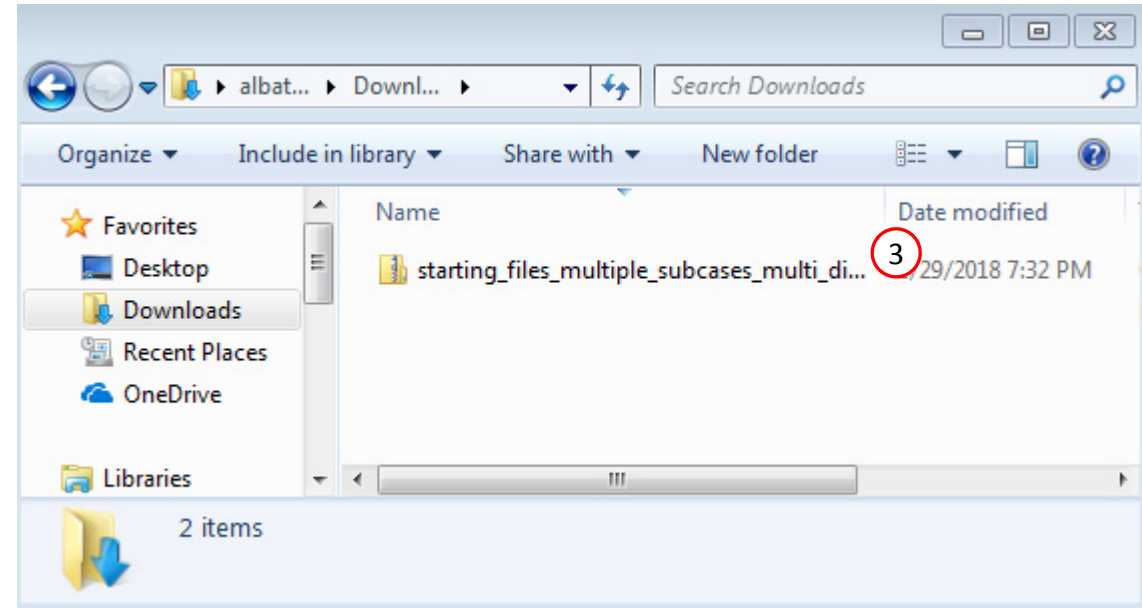
1 Optimization for Multiple Load Cases or SUBCASES

The web app makes simple configuring design constraints for dozens or hundreds of load cases. This tutorial guides you through the process.

Starting BDF Files: [Link](#)

Solution BDF Files: [Link](#)

Global Optimization



Open the Correct Page

1. Click on the indicated link

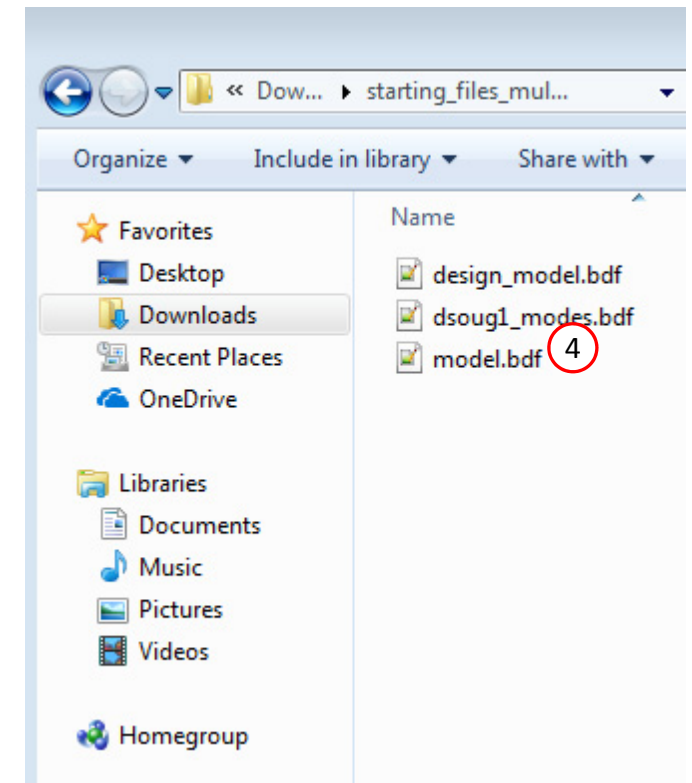
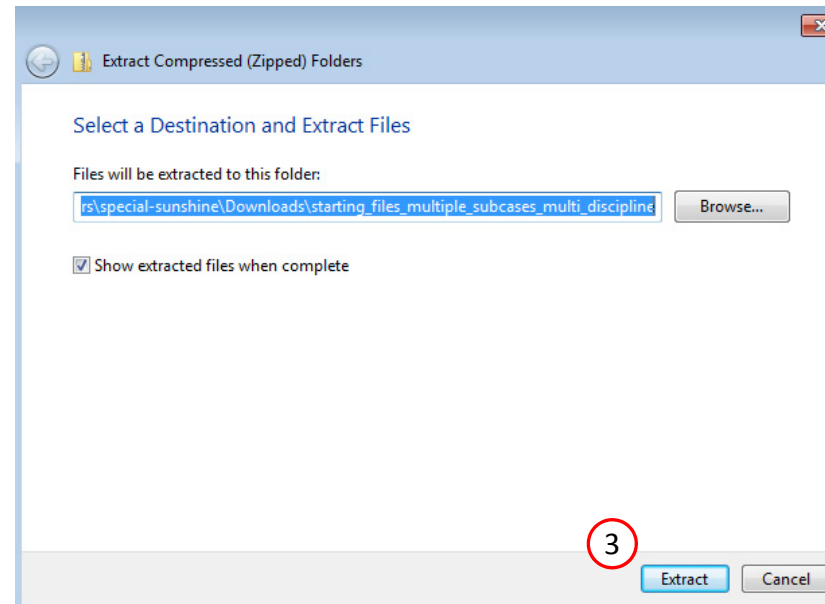
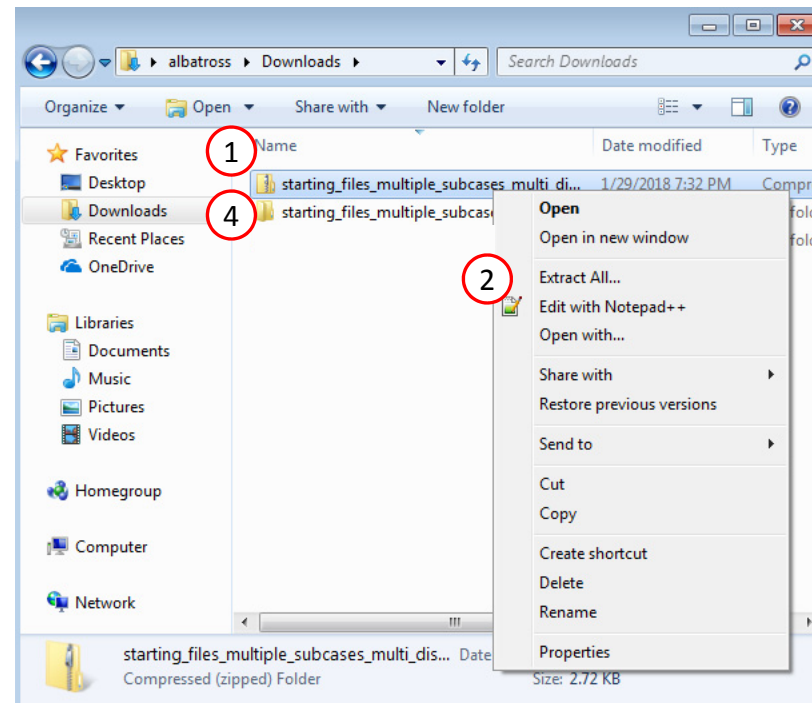
- MSC Nastran can perform many optimization types. The SOL 200 Web App includes dedicated web apps for the following:
 - Optimization for SOL 200 (Size, Topology, Topometry, Topography, Local Optimization, Sensitivity Analysis and Global Optimization)
 - Multi Model Optimization
 - Machine Learning
- The web app also features the HDF5 Explorer, a web application to extract results from the H5 file type.



Obtain Starting Files

1. Right click on the zip file
2. Select Extract All...
3. Click Extract
4. The starting files are now available in a folder

- This example is using a previously created design model. The design model is a model that has been converted to SOL 200 and contains bulk data entries describing the optimization problem statement, e.g. variables, objective and constraints.



Merge the BDF files

Two sets of bulk data files (BDF) have been provided.

- Set 1: model.bdf and design_model.bdf
- Set 2: dsoug1_modes.bdf

The Set 1 files are configured to perform only a static analysis optimization and contains 19 load cases. The Set 2 file is the same Finite Element Model, but configured to perform an eigenvalue or normal modes analysis. The procedure below merges information from Set 2 to Set 1. Afterwards, the files of Set 1 can be modified to perform both a static and normal modes analysis for 20 subcases.

1. Open *dsoug1_modes.bdf*. Take SUBCASE 1 and move it to *model.bdf*.
2. Take the line with EIGRL at the beginning and move it to *model.bdf*
3. Save *model.bdf*

- There are 2 methods to perform multidisciplinary optimization:
 - Method 1 - Merge the necessary bulk data files and use ANALYSIS in each SUBCASE, e.g. ANALYSIS=STATICS, ANALYSIS=MODES. This method is used for this tutorial.
 - Method 2 – Use the Multi Model Optimization capability. This does not require that manual merging of files as shown on this page.

```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
model.bdf
1 assign userfile = 'optimization_results.csv', status = new,
2 form = formatted, unit = 52
3 $ 1__|2__|3__|4__|5__|6__|7__|8__|9__|10__|
4 ID MSC_DSOUG1 $ v2004 ehj 25-Jun-2003
5 TIME 10 $
6 SOL 200
7 CEND
8
9
10 TITLE = SYMMETRIC THREE BAR TRUSS DESIGN OPTIMIZATION - DSOUG1
11 SUBTITLE = BASELINE - 2 CROSS SECTIONAL AREAS AS DESIGN VARIABLES
12 $ Result Output
13 ECHO = SORT
14 SPC = 100
15 DISPLACEMENT(SORT1,REAL)=ALL
16 SPCFORCES(SORT1,REAL)=ALL
17 STRESS(SORT1,REAL,VONMISES,BILIN)=ALL
18 $ Subcases
19 $ DSAPRT(FORMATTED, EXPORT, END=SENS) = ALL
20 ANALYSIS = STATICS
21 DESOBJ(MIN) = 8000000
22 DESSUB = 40000004
23 $ DESSUB Size
24 SUBCASE 1
25 SUBTITLE=Modes Analysis
26 METHOD = 1
27 SPC = 100
28 VECTOR(SORT1,REAL)=ALL
29 SPCFORCES(SORT1,REAL)=ALL
30 SUBCASE 2
31 $ DESSUB Slot
32 $ ANALYSIS Slot
33 $ DRSPAN Slot
34 SUBTITLE=Static Analysis 1

dsoug1_modes.bdf
1 $ MSC.Nastran input file created on November 02, 2017 at 15:0
2 $ Patran 2017.0.2
3 $ Direct Text Input for Nastran System Cell Section
4 $ Direct Text Input for File Management Section
5 $ Direct Text Input for Executive Control
6 $ Normal Modes Analysis, Database
7 SOL 103
8 CEND
9 $ Direct Text Input for Global Case Control Data
10 TITLE = SYMMETRIC THREE BAR TRUSS DESIGN OPTIMIZATION -
11 ECHO = NONE
12 $ Result Output
13 SUBCASE 1
14 SUBTITLE=Modes Analysis
15 METHOD = 1
16 SPC = 100
17 VECTOR(SORT1,REAL)=ALL
18 SPCFORCES(SORT1,REAL)=ALL
19 $ Direct Text Input for this Subcase
20 BEGIN BULK
21 $ Direct Text Input for Bulk Data
22 PARAM POST 0
23 PARAM PRTMAXIM YES 3 0
24 EIGRL 1 11 1 4
25 $ Elements and Element Properties for region : prod.11
26 PROD 11 1 1.
27 $ Pset: "prod.11" will be imported as: "prod.11"
28 CROD 1 11 1 4
29 $ Elements and Element Properties for region : prod.12
30 PROD 12 1 2.
31 $ Pset: "prod.12" will be imported as: "prod.12"
32 CROD 2 12 2 4
33 $ Elements and Element Properties for region : prod.13
34 PROD 13 1 1.
```

```
163 BEGIN BULK
164 INCLUDE './design_model.bdf'
165
166 param, post, 0
167 PARAM PRTMAXIM YES
168 EIGRL 1 11 1 4 MASS
169
170 $
171 $ ANALYSIS MODEL
172 $
173 $ GRID DATA
174 $
175 $ GRID DATA
176 $ 2 3 4 5 6 7 8 9 10
177 GRID 1 -10.0 0.0 0.0
178 GRID 2 0.0 0.0 0.0
179 GRID 3 10.0 0.0 0.0
180 GRID 4 0.0 -10.0 0.0
181 $ SUPPORT DATA
182 SPC1 100 123456 1 THRU 3
183 $ ELEMENT DATA
184 CROD 1 11 1 4
185 CROD 2 12 2 4
186 CROD 3 13 3 4
187 $ PROPERTY DATA
188 PROD 11 1 1.0
189 PROD 12 1 2.0
190 PROD 13 1 1.0
191 MAT1 1 1.0E+7 0.33 0.1
192 $ EXTERNAL LOADS DATA
193 FORCE 300 4 20000. 0.8 -0.6
194 FORCE 310 4 20000. -0.8 -0.6
195 ENDDATA

dsoug1_modes.bdf
20 BEGIN BULK
21 $ Direct Text Input for Bulk Data
22 PARAM POST 0
23 PARAM PRTMAXIM YES 3 0
24 EIGRL 1 11 1 4
25 $ Elements and Element Properties for region : prod.11
26 PROD 11 1 1.
27 $ Pset: "prod.11" will be imported as: "prod.11"
28 CROD 1 11 1 4
29 $ Elements and Element Properties for region : prod.12
30 PROD 12 1 2.
31 $ Pset: "prod.12" will be imported as: "prod.12"
32 CROD 2 12 2 4
33 $ Elements and Element Properties for region : prod.13
34 PROD 13 1 1.
35 $ Pset: "prod.13" will be imported as: "prod.13"
36 CROD 3 13 3 4
37 $ Referenced Material Records
38 $ Material Record : mat1.1
39 $ Description of Material :
40 MAT1 1 1.+7 3.7594+6.33 .1
41 $ Nodes of the Entire Model
42 GRID 1 -10. 0. 0.
43 GRID 2 0. 0. 0.
44 GRID 3 10. 0. 0.
45 GRID 4 0. -10. 0.
46 $ Loads for Load Case : Default
47 SPCADD 2 100
48 $ Displacement Constraints of Load Set : spc1.100
49 SPC1 100 123456 1 2 3
50 $ Referenced Coordinate Frames
51 ENDDATA 202082fa
52
```

Upload BDF Files

1. Click 1. Select Files
2. Select these two files:
 - model.bdf
 - design_model.bdf
3. Click Open
4. Click Upload Files

- The process starts by uploading all the necessary BDF files. The BDF files can be files of your own or files found in the Tutorials section of the User's Guide.

Step 1 - Upload .BDF Files

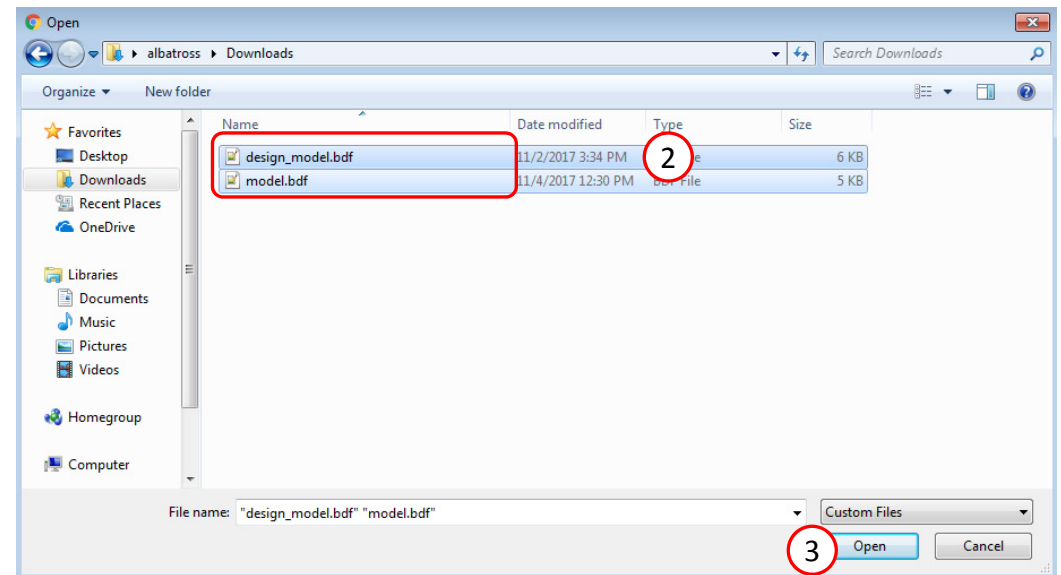
1. Select files 2 files selected

Inspecting: 100%

4. Upload files

Uploading: 100 %

☐ List of Selected Files



Create Design Constraints

1. Click Constraints
2. Set the analysis type to Normal Modes
3. Click the plus (+) icon for Frequency
4. Configure the following for constraint r1
 1. ATTA: 1 (mode 1)
 2. Lower Allowed Limit: 80. (80. Hz)

- Part of the design model has already been created. The variables, objective and constraints for a statics optimization have been configured. On this page, a new constraint for the 1st natural frequency is created. The goal is to perform both a statics and modes optimization.

1

Step 1 - Select constraints

Select an analysis type

2

SOL 103 - Normal Modes

Select a response

	Response Description ▾	Response Type ▾
	<input type="text" value="Search"/>	<input type="text" value="Search"/>
	Weight	WEIGHT
	Volume	VOLUME
	Eigenvalue	EIGN
3	Frequency	FREQ
	Displacement	DISP

« 1 2 3 »

5 10 20 30 40 50

Step 2 - Adjust constraints

+ Options

	Label ▾	Status ▾	Response Type ▾	Property Type ▾	ATTA ▾	ATTB ▾	ATTi ▾	Lower Allowed Limit	Upper Allowed Limit
	<input type="text" value="St"/>	<input type="text" value="Seal"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>
	r1		DISP		12 - T1, T2 ▾		4	-2	.2
	r2		STRESS	PROD ▾	2 - Axial stress ▾		11, 12, 13	-15000.	20000.
	r3		FREQ	STRUC ▾	1 4.1		4.2	80.	Upper

5 10 20 30 40 50

Export New BDF Files

1. Click on Exporter
2. Note that a cautionary message is presented.
3. Click Jump To Table

- The natural frequency constraint was just created, but a message appears indicating that the constraint was not assigned to a SUBCASE.

SOL 200 Web App - Optimization Upload Variables Objective Constraints Subcases **Exporter** Results Settings Match Other User's Guide Home

BDF Output - Model

```
assign userfile = 'optimization_results.csv', status = unknown,
form = formatted, unit = 52
$_1_||_2_||_3_||_4_||_5_||_6_||_7_||_8_||_9_||_10_
ID MSC DSOUG1 $ v2004 ehj 25-Jun-2003
TIME 10 $
SOL 200
CEND

TITLE = SYMMETRIC THREE BAR TRUSS DESIGN OPTIMIZATION - DSOUG1
SUBTITLE = BASELINE - 2 CROSS SECTIONAL AREAS AS DESIGN VARIABLES
$ Result Output
ECHO = NONE
SPC = 100
DISPLACEMENT(SORT1,REAL)=ALL
SPCFORCES(SORT1,REAL)=ALL
STRESS(SORT1,REAL,VONMISES,BILIN)=ALL
$ Subcases
DESOBJ(MIN) = 8000000
$ DESGLB Slot
$ DSAPRT(FORMATTED, EXPORT, END=SENS) = ALL
SUBCASE 1
ANALYSIS = MODES
$ DESSUB Slot
$ DRSPAN Slot
SUBTITLE=Modes Analysis
METHOD = 1
SPC = 100
VECTOR(SORT1,REAL)=ALL
SPCFORCES(SORT1,REAL)=ALL
SUBCASE 2
```

BDF Output - Design Model

```
$*****
$*
$*          Design Model          *
$*
$*****
$
$          Design Variables - Type 1
$-----
$
$
DVPREL1 1000001 PROD 11 A
100001 1.0
DVPREL1 1000002 PROD 12 A
100002 1.0
DVPREL1 1000003 PROD 13 A
100003 1.0
$
$
DESVAR 100001 x1 1.0 .001 100.
DESVAR 100002 x2 2.0 .001 100.
DESVAR 100003 x3 1.0 .001 100.
$
$
$
DLINK 1 100003 100001 1.0
$
$          Design Variables - Type 2
$-----
$
$
$
$          Design Objective
$-----
$
$
DRESP1 8000000 r0 WEIGHT 3 3
$
```

Download BDF Files

[Download BDF Files](#)



Caution! Not all constraints have been assigned to a subcase. Check the Status column of the following tables.
Correct: Incorrect:

Constraints [Jump to table](#) Step 1 - Assign constraints to subcases

Developed by The Engineering Lab

Assign Constraints to Load Cases (SUBCASES)

1. Click Subcases
2. Select each option in the select box (Hold down the Shift key on the keyboard and use the mouse to select multiple options)
3. Click the Right Arrow to expand the width of the table
4. Note that the r3 constraint for natural frequency has a yellow status icon, indicating that the constraint is not assigned to any subcases
5. Change the analysis type of column SUBCASE 1 to Normal Modes
6. Mark the checkbox

- A change from a yellow to blue status ( => ) means the constraint is assigned to at least one column
- r3 or the natural frequency constraint is applied to SUBCASE 1

SOL 200 Web App - Optimization Upload Variables Objective Constraints **Subcases** Exporter Results Settings Match Other User's Guide Home




Step 1 - Assign constraints to subcases

Display Columns

SUBCASE 15
SUBCASE 16
SUBCASE 17
SUBCASE 18
SUBCASE 19
SUBCASE 20

Uncheck visible boxes Check visible boxes

+ Options

Status	Label	Response Type	Analysis Type	Description	Global Constraints	SUBCASE 1	SUBCASE 2	SUBCASE 3	SUBCASE 4	SUBCASE 5	SUBCASE 6	SUBCASE 7	SUBCASE 8	SUBCASE 9	SUBCASE 10
	Search	Search	Search	Search											
					Analysis Types	Normal Modes	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Statics
	r3	FREQ	MODES	Natural frequency of mode 1		<input type="checkbox"/>									
	r1	DISP	STATICS	T1, T2 component(s) of displacement at grid 4			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	r2	STRESS	STATICS	Stress, item code 2, of elements associated with PROD 11, 12, 13			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

5 10 20 30 40 50

1. Click on Exporter
2. Click the Left Arrow to expand the width of the section BDF Output – Design Model
3. Click on Download BDF Files

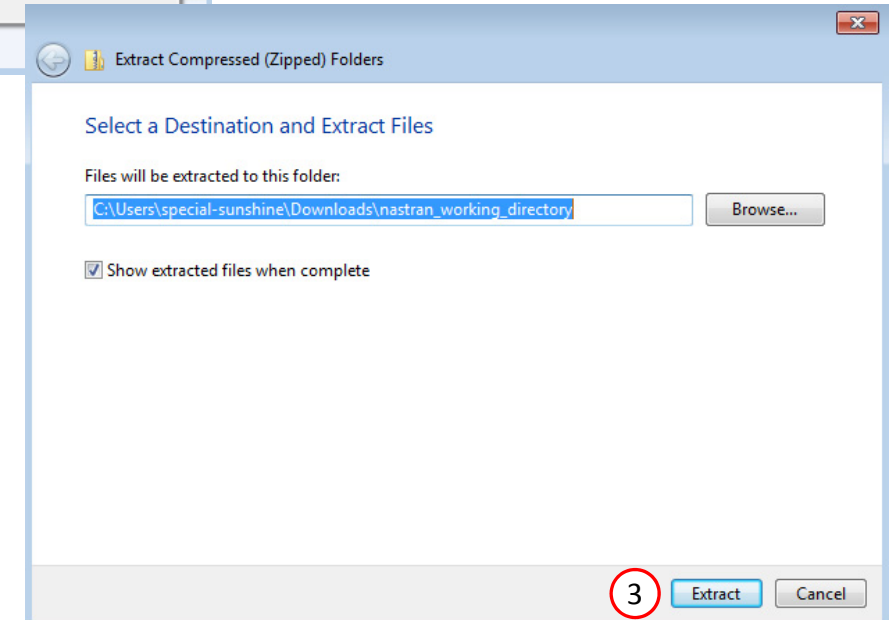
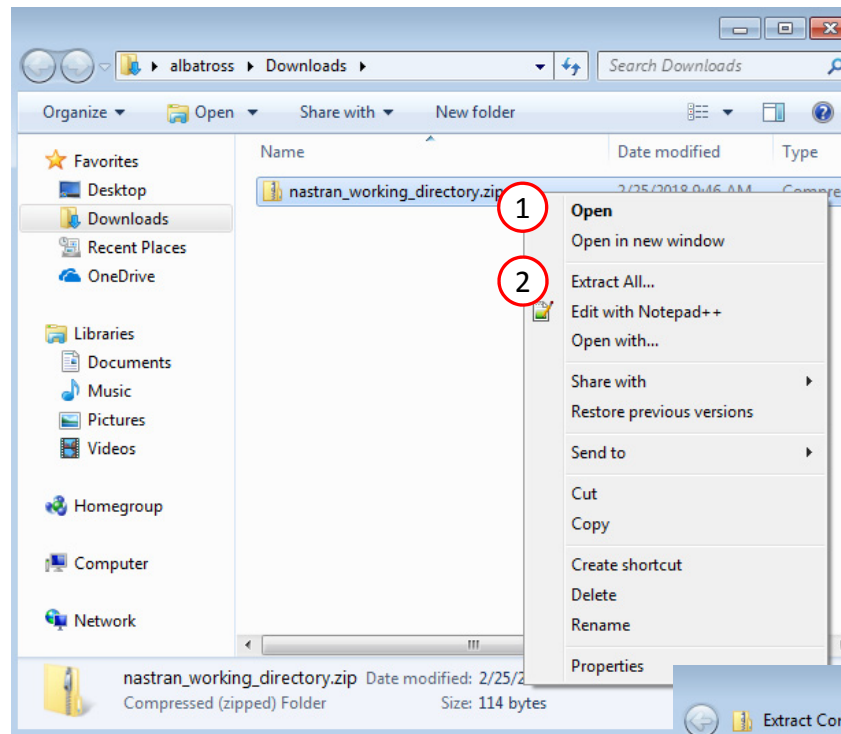
- When the download button is clicked a new file named "nastran_working_directory" is downloaded. If the file already exists in your local folder, the folder name is appended with a number, e.g. "nastran_working_directory (1).zip"

Questions? Email: christian@the-engineering-lab.com

Perform the Optimization with Nastran SOL 200

1. A new .zip file has been downloaded
2. Right click on the file
3. Click Extract All
4. Click Extract on the following window

- Always extract the contents of the ZIP file to a new, empty folder.



Perform the Optimization with Nastran SOL 200

1. Inside of the new folder, double click on Start MSC Nastran
2. Click Open, Run or Allow Access on any subsequent windows
3. MSC Nastran will now start

- After a successful optimization, the results will be automatically displayed as long as the following files are present: BDF, F06 and LOG.
- One can run the Nastran job on a remote machine as follows:
 - 1) Copy the BDF files and the INCLUDE files to a remote machine.
 - 2) Run the MSC Nastran job on the remote machine.
 - 3) After completion, copy the BDF, F06, LOG, H5 files to the local machine.
 - 4) Click "Start MSC Nastran" to display the results.

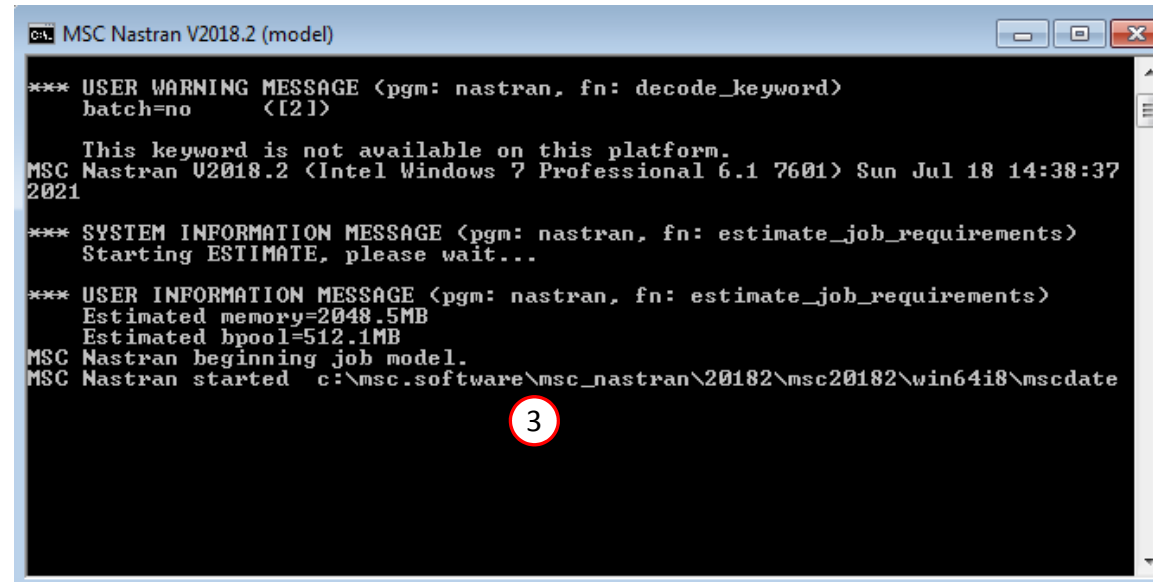
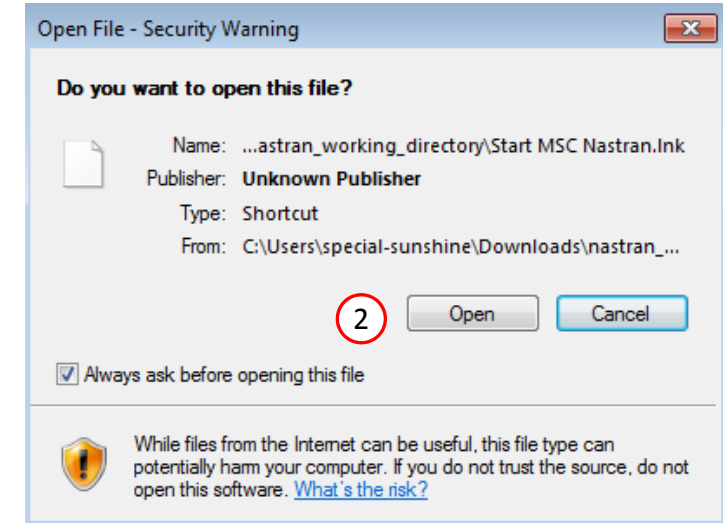
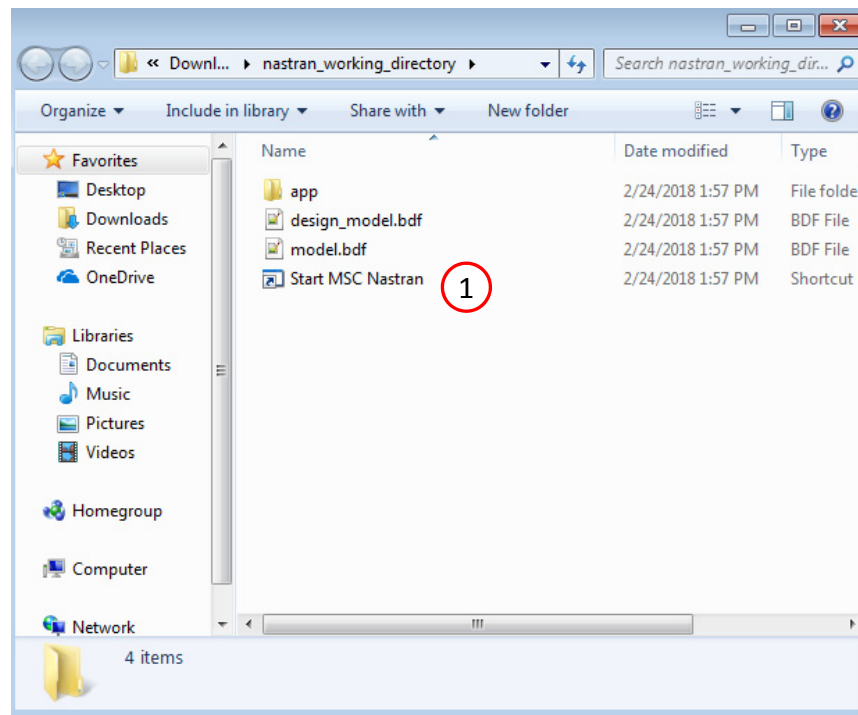
Using Linux?

Follow these instructions:

- 1) Open Terminal
- 2) Navigate to the nastran_working_directory
`cd ./nastran_working_directory`
- 3) Use this command to start the process
`./Start_MSC_Nastran.sh`

In some instances, execute permission must be granted to the directory. Use this command. This command assumes you are one folder level up.

```
sudo chmod -R u+x ./nastran_working_directory
```



Status

- 1. While MSC Nastran is running, a status page will show the current state of MSC Nastran

- The status of the MSC Nastran job is reported on the Status page. Note that Windows 7 users will experience a delay in the status updates. All other users of Windows 10 and Red Hat Linux will see immediate status updates.

SOL 200 Web App - Status

 Python  MSC Nastran

Status

Name	Status of Job	Design Cycle	RUN TERMINATED DUE TO
model.bdf	Running	None	

Review Optimization Results

After MSC Nastran is finished, the results will be automatically uploaded.

1. Ensure the messages shown have green checkmarks. This is indication of success. Any red icons indicate challenges.
2. The final value of objective, normalized constraints (not shown) and design variables can be reviewed.

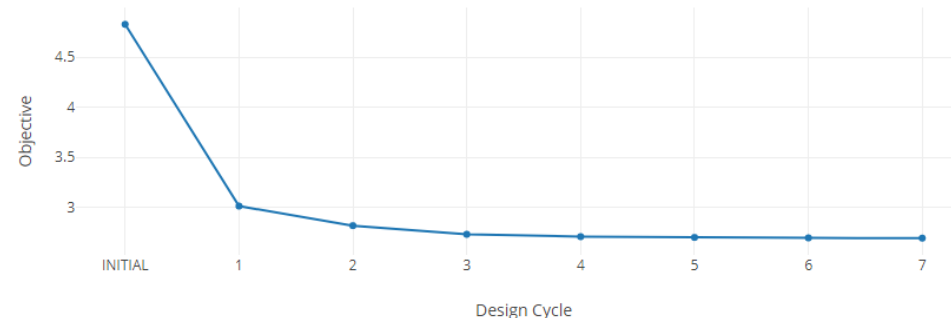
- The results shown are the outcome of a multidisciplinary optimization for both statics and modes.

Final Message in .f06

1

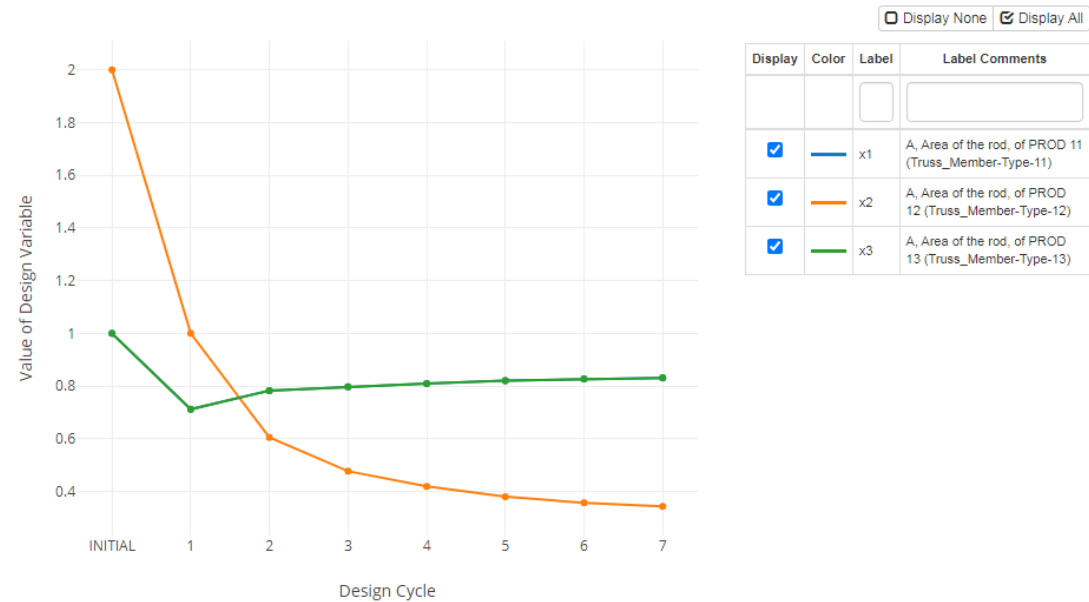
✓ RUN TERMINATED DUE TO HARD CONVERGENCE TO AN OPTIMUM AT CYCLE NUMBER = 7.

Objective



2

Design Variables



Extra Information

1. Hold down the SHIFT key on the keyboard and hover the mouse cursor over checkboxes to mark multiple checkboxes without mouse clicking frequently

1. Hold down the SHIFT key on the keyboard and hover the mouse cursor over checkboxes to mark multiple checkboxes without mouse clicking frequently

SOL 200 Web App - Optimization

Upload Variables Objective Constraints Subcases Exporter Results Settings Match Other User's Guide Home

Step 1 - Assign constraints to subcases

Display Columns

- SUBCASE 15
- SUBCASE 16
- SUBCASE 17
- SUBCASE 18
- SUBCASE 19
- SUBCASE 20

Hold down the
SHIFT key and hover
over the cells to
mark multiple
checkboxes

+ Options

Status	Label	Response Type	Analysis Type	Description	Global Constraints	SUBCASE 1	SUBCASE 2	SUBCASE 3	SUBCASE 4	SUBCASE 5	SUBCASE 6	SUBCASE 7	SUBCASE 8	SUBCASE 9	SU
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>											
					Analysis Types	Normal Modes	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Sta
	r1	DISP	STATICS	T1, T2 component(s) of displacement at grid 4			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	r2	STRESS	STATICS	Stress, item code 2, of elements associated with PROD 11, 12, 13			<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	r3	FREQ	Modes	Natural frequency of mode 1		<input checked="" type="checkbox"/>									

5 10 20 30 40 50

BDF Output - Design Model

```
$
$
$
DCONADD 40000001
DCONADD 40000002
DCONADD 40000004
```


Assign Constraints to Load Cases (SUBCASES)

- 1. If you click Uncheck visible boxes, every visible checkbox will be unmarked

SOL 200 Web App - Optimization

UploadVariablesObjectiveConstraintsSubcasesExporterResults

SettingsMatchOtherUser's GuideHome

Step 1 - Assign constraints to subcases

Display Columns

Global Constraints
SUBCASE 1
SUBCASE 2
SUBCASE 3
SUBCASE 4
SUBCASE 5
SUBCASE 6

Uncheck visible boxes

Check visible boxes

1

+ Options

Status	Label	Response Type	Analysis Type	Description
	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>
	r1	DISP	STATICS	T1, T2 component(s) of displacement at grid 4
	r2	STRESS	STATICS	Stress, item code 2, of elements associated with PROD 11, 12, 13
	r3	FREQ	MODES	Natural frequency of mode 1

Global Constraints	SUBCASE 1	SUBCASE 2	SUBCASE 3	SUBCASE 4	SUBCASE 5	SUBCASE 6	SUBCASE 7	SUBCASE 8	SUBCASE 9	SU
Analysis Types	Normal Modes	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Sta
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>									

5

10

20

30

40

50

1. If you click Check visible boxes, every visible checkbox will be marked

3DF
Output -
Design
Model

Assign Constraints to Load Cases (SUBCASES)

1. Click the indicated icon and the SUBCASEs in which the constraint has been assigned will be displayed.

In this example, the columns for SUBCASE 2, 5 and 6 have been displayed because the r1 constraint has been assigned to these SUBCASESs

Step 1 - Assign constraints to subcases

Display Columns

Global Constraints

SUBCASE 1

SUBCASE 2

SUBCASE 3




SUBCASE 4

SUBCASE 5

SUBCASE 6

☐ Uncheck visible boxes☒ Check visible boxes

+ Options

Status	Label	Response Type	Analysis Type	Description	SUBCASE 2	SUBCASE 5	SUBCASE 6
	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>	<input type="text" value="Search"/>			
					Statics	Statics	Statics
 1	r1	DISP	STATICS	T1, T2 component(s) of displacement at grid 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	r2	STRESS	STATICS	Stress, item code 2, of elements associated with PROD 11, 12, 13	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	r3	FREQ	MODES	Natural frequency of mode 1			

Assign Constraints to Load Cases (SUBCASES)

1. The Analysis Type bar will be shown automatically if constraints of different analysis types are created
2. Alternatively, the Analysis Type bar can be manually turned on by clicking *+Options* , then mark the checkbox for Use Multidisciplinary (MD) Optimization
3. The analysis type for each SUBCASE can be manually changed

SOL 200 Web App - Optimization Upload Variables Objective Constraints **Subcases** Exporter Results Settings Match Other User's Guide Home

Step 1 - Assign constraints to subcases

Display Columns

SUBCASE 15
SUBCASE 16
SUBCASE 17
SUBCASE 18
SUBCASE 19
SUBCASE 20

Uncheck visible boxes Check visible boxes

+ Options **2**

☒ Use Multidisciplinary (MD) Optimization

Status	Label	Response Type	Analysis Type	Description	Global Constraints	SUBCASE 1	SUBCASE 2	SUBCASE 3	SUBCASE 4	SUBCASE 5	SUBCASE 6	SUBCASE 7	SUBCASE 8	SUBCASE 9	SU
	Search	Search	Search	Search											
					1	Analysis Types →	Normal Modes	Statics	Statics	Statics	Statics	Statics	Statics	Statics	Sta
	r1	DISP	STATICS	T1, T2 component(s) of displacement at grid 4			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	r2	STRESS	STATICS	Stress, item code 2, of elements associated with PROD 11, 12, 13			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	r3	FREQ	Modes	Natural frequency of mode 1		<input checked="" type="checkbox"/>									

Statics
Normal Modes
Buckling
Direct Complex Eigenvalues
Direct Frequency Response
Modal Complex Eigenvalues
Modal Frequency Response
Modal Transient Response
Static Aeroelastic Response
Aerodynamic Flutter

5 10 20 30 40 50

☐ Step A - Optional - Assign objective to subcase

BDF
Output -
Design
Model

\$
\$
\$
DCONADO 40000001 3
DCONADO 40000002 3

End of Tutorial