

Altair HyperMesh 2019 Tutorials

HM-3440: Model Build and Assembly

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In this tutorial, you will learn how to:

- Import a PLMXML file.
- Load and create a Common representation and NVH representation for modal analysis
- Import connector parts, add connector representations, and realize connectors
- Edit part attributes using the Entity Editor to reflect design changes
- Activate configurations
- Import and Export an assembly as a Solver Deck
- Renumber entities using the ID-Manager
- Check for errors using the Model Checker

Model Files

This exercise uses the files located in the HM-3440 folder, which can be found in the hm.zip file. Copy the file(s) from this directory to your working directory.

Exercise

Step 1: Start HyperMesh Desktop and Load the OptiStruct User Profile

- 1. Start HyperMesh Desktop.
- 2. In the **User Profile** dialog, select **OptiStruct**.
- 3. Click **OK**.

Step 2: Import the PLMXML File

- 1. Open the **Import BOM** tab by clicking *File > Import > BOM* from the menu bar.
- 2. In the File field, open the BOM input.xml file.



- Part Assemblies/Parts UD Revision Representation Active • 順 Model Underbody_000425_Safety Underbody Α \checkmark Connectors_000481 **V** Connectors А Center_Rails_000482 Center_Rails ~ А Center_Rail_Connectors_var1_000484 ~ A.-**V** Center_Rail_Connectors_var2_000485 🔲 Center_Rail_Connectors_var2 A.-Longitudinal_Rails_000497 Longitudinal_Rails **V** А Longitudinal_Rails_Connectors_000486 🔲 Longitudinal_Rails_Connectors ~ A.-~ Frame_Assembly_000495 Frame_Assembly А Easterna LeftRail_A_000433_Safety LeftRail_A А **V** LeftInner_A_000434_Safety LeftInner_A **V** A.-LeftOuter_A_000435_Safety LeftOuter_A **V** A.-RightRail_A_000436_Safety RightRail_A **V** Α RightInner_A_000437_Safety RightInner_A \checkmark A -RightOuter_A_000438_Safety RightOuter_A **V** A.-CenterRail_A_000426_Safety CenterRail_A ~ А 🕂 🛍 CenterRail_var1_A_000427_Safety CenterRail_var1_A ~ А **V** CenterInner_A_000428_Safety CenterInner_A A.-CenterOuter_A_000429_Safety CenterOuter_A **V** A.-CenterRail_var2_A_000430_Safety CenterRail_var2_A ~ А ~ 💵 CenterInner_var2_A_000431_Safety 📃 CenterInner_var2_A A.-CenterOuter_var2_A_000432_Safety CenterOuter_var2_A **V** A.-
- 3. Click *Import*. Part assemblies and parts are imported into the session.

Step 3: Load and Create a Common Representation

Steps 3.4 - 3.6 below are optional as the Common representation can be created without loading the CAD into the session. Since the Common representation forms the basis of subsequent discipline specific mesh representations, its creation is a prerequisite for the next steps.

Open the **Part** browser by clicking *View* > *Browsers* > *HyperMesh* > *Part* from the 1. menu bar.



2. In the **Part** browser, right-click and on one of the column headers and enable the following columns from the context menu: PDM PID, PDM MID, PDM Material, PDM Thickness, and PDM MeshFlag.

These columns show the PDM metadata that is parsed upon importation of the PLMXML file. This information is also shown in the **Entity Editor**, **PDM Data** pane.

PDM PID		ID PDM	Material	PDM	Thic	kness	PDM	Mes
	D ID							
	Co	olor						
	VI	ID						
	Re Re	evision						
	R R	epresenta	ation					
	💌 Ad	ctive						
	CI	D						
	PI	D						
	M							
		aterial						
		hickness						
101		DM PID				2.7		
102	_	DM MID				2.7		
	_	DM Mater						
103	_	DM Thick				2.5		
104		DM Mesh	-			2.5		
		DM Varia						
201	PI	DM Varia	nt Scope	Э		1.7		
202	<u>A</u> ll			<u>N</u> one	e	1.5		
301		10 Steel				1.7		
302		10 Steel				1.5		

- Right-click on the Frame_Assembly_000495 part assembly and select *Representations > Load > from Session* from the context menu.
- 4. In the **Change Representations** dialog, **Load** tab, select the **CAD** representation.

💎 Change Representation		×
Create Load Library		
Representations		Available
CAD CAD		8/8
Parts *	BatchMesh	Unavailable
	ОК	Cancel



- 😮 UID Part Assemblies/Parts Revision Represe CenterRail_A_000426_Safety CenterRail_A А CenterRail_var1_A_000427_Safety CenterRail_var1_A А CenterInner_A_000428_Safety CenterInner_A A.- CAD 🔤 🗗 Center_Inner CenterOuter_A_000429_Safety CenterOuter_A A.- CAD 🗖 🗭 Center_Outer 🖷 CenterRail_var2_A_000430_Safety 🛛 🔳 CenterRail_var2_A A CenterInner_var2_A_000431_Safety DenterInner_var2_A Denter_Inner_var2 - 💷 CenterOuter_var2_A_000432_Safety 📗 CenterOu Denter_Outer_var2 📕 LeftRail_A LeftRail_A_000433_Safety LeftInner_A 🛄 💋 🔀 Left_Inner ← I LeftOuter_A_000435_Safety LeftOuter_A A- CAD 🗖 🗗 Left_Outer 询 RightRail_A_000436_Safety RightRail_A Α RightInner_A_000437_Safety RightInner_A A.- CAD Dight_Inner RightOuter_A_000438_Safety RightOuter_A A.- CAD 💋 🖽 Right_Outer
- 5. Click **OK**. All available CAD representations are imported into the session.

- 6. Right-click on the Frame_Assembly_000495 part assembly and select *Representations* > *Create* from the context menu.
- 7. In the Change Representations dialog, Create tab, select Common (0/8).

٧	Change Representation		×
Crea	te Load Library		
	Representations		Available
	Common		0/8
	Crash 5mm		0/8
	Crash 10mm		0/8
	Durability 5mm		0/8
	NVH 10mm		0/8
	NVH 15mm		0/8
	Tetra 5mm		0/8
			1 of 7 selected
	Midsurface method	Skin	* 🔽 Save to Library
			OK Cancel



- 8. Click **OK**. Available CAD representations are sent to the BatchMesher for processing.
 - **Note:** In the case of sheet metal parts, the BatchMesher extracts the midsurface from the solid CAD representation. You can choose a Midsurface method, include Skin, Offset, Offset + Planes, Offset + Planes + Sweeps.

ile <u>H</u> elp Run Setup Run Status Configura	ations User Proce	dures			
Name	Geom Type	Mesh Type	Status		1
Run Status Run Status Run 1 Pre-Run procedure Left_Inner.jt Right_Outer.jt Right_Outer.jt Center_Inner.jt Center_Outer.jt Center_Inner_var2.jt Post-Run procedure	Auto Auto Auto Auto Auto Auto Auto	Common Common Common Common Common Common Common	Results in - C:\Users\Documents\bm_190113_001 Done Done Done Done Done Done Done Done		
Load Mesh Details Ru	IN Details Qualit	y Report	Pause Resume Now Resume At: 1/13/19 1	Cancel	

- 9. In the **BatchMesh** dialog, click **Yes** to load the new representations for the eight parts.
- 10. Repeat steps 3.7 3.10 to create NVH10 and NVH15 representations.

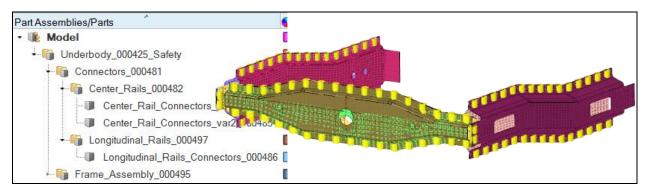
Step 6: Add Connector Representations

- In the **Part** browser, right-click on the Connectors_000481 part assembly and select *Representations* > *Load* > *from Session* from the context menu.
- 2. In the **Change Representation** dialog, **Load** tab, select the **Connector** representation.

💗 Change Representation		×
Create Load Library		
Representations		Available
Connector		3/3
Parts *	BatchMesh	Unavailable
	ОК	Cancel



3. Click **OK**. Connectors are loaded, and the Representation column shows the Connector representation loaded.



Step 7: Design change - modify Center Rail part attributes

1. In the **Part** browser note the PID of parts CenterInner_var2_A_000431_Safety and CenterOuter_var2_A_000432_Safety.

Part Assemblies/Parts	😵 UID	Revis Representatio	n Active	CID	PID
- 🎼 Model					
 Inderbody_000425_Safety 	📕 Underbody	A			
Connectors_000481	Connectors	А			
Frame_Assembly_000495	Frame_Assembly	А			
⊷ 🎁 CenterRail_A_000426_Safety	CenterRail_A	А			
👘 CenterRail_var1_A_000427_Safety	CenterRail_var1_A	А			
↓ <a>fig CenterRail_var2_A_000430_Safety	CenterRail_var2_A	А			
CenterInner_var2_A_000431_Safety	CenterInner_var2_A	A3 NVH 15mm		103	103
CenterOuter_var2_A_000432_Safety	CenterOuter_var2_A	A3 NVH 15mm		104	104
👘 LeftRail_A_000433_Safety	LeftRail_A	А			
└────────────────────────────────────	RightRail_A	А			

2. In the **Model** browser, switch the view mode to **Properties**.



3. Select PID 103 and 104. The **EntityEditor** opens and displays the two properties common corresponding attributes.

`	Properties	ID	•	Include	Define	ed Type	Card Image	Thickness	MID	Material Type	Material
:	LeftInner_A.p01	201		0	V	2D	PSHELL	1.7	10	ISOTROPIC	Steel
\$	LeftOuter_A.p01	202		0	V	2D	PSHELL	1.5	10	ISOTROPIC	Steel
9	RightInner_A.p01	301		0		2D	PSHELL	1.7	10	ISOTROPIC	Steel
:	RightOuter_A.p01	302		0		2D	PSHELL	1.5	10	ISOTROPIC	Steel
:	CenterInner_A.p01	101		0		2D	PSHELL	2.7	10	ISOTROPIC	Steel
:	CenterOuter_A.p01	102		0	V	2D	PSHELL	2.7	10	ISOTROPIC	Steel
:	CenterInner_var2_A.p0	01 103		0		2D	PSHELL	2.5	10	ISOTROPIC	Steel
:	CenterOuter_var2_A.p	01 104		0		2D	PSHELL	2.5	10	ISOTROPIC	Steel
Na	me Va	alue									
1	Solver Keyword P	SHELL									
	Color 📕										
	Include [N	/laster M	ode	el]							
	Defined 🔽	1									
- (Card Image P	SHELL									
	Material (1	0) Steel									
	User Comments H	ide In Me	enu/	Export							
	T 2.	5									
	MID2 10	D									
	MID2_opts]									
	12_T3										
	MID3 10	D									
	MID3_opts										
	TS_T										
		0									

- 4. In the Entity Editor, T field, enter 3.0.
- 5. In the **Part** browser, notice the attribute modification you made is updated in the **Thickness** columns. Save these changes to ensure that they are available if the current representation is unloaded.

Part Assemblies/Parts	S UID	Revis	Representation	Active	CID	PID	MID Material	Thickness Pl
• 🎼 Model								
↓ 🥡 Underbody_000425_Safety	📕 Underbody	Α						
Connectors_000481	Connectors	Α						
Frame_Assembly_000495	Frame_Assembly	Α						
CenterRail_A_000426_Safety	CenterRail_A	Α						
CenterRail_var1_A_000427_Safety	📒 CenterRail_var1_A	Α						
⊷ 🛍 CenterRail_var2_A_000430_Safety	CenterRail_var2_A	Α						
CenterInner_var2_A_000431_Safety	CenterInner_var2_A	A3	NVH 15mm		103	103	10 Steel	3.000000
CenterOuter_var2_A_000432_Safety	CenterOuter_var2_A	A3	NVH 15mm		104	104	10 Steel	3.000000
LeftRail_A_000433_Safety	📕 LeftRail_A	А						
└────────────────────────────────────	RightRail_A	Α						



Step 8: Create Part Sets

Create part sets Var1 and Var2 for Variant 1 and Variant 2 in the Part Set view.

1. In the **Part** browser, enable the **Part Set** view.



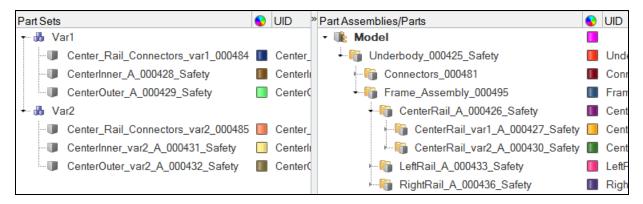
- 2. Create two part sets.
 - a. In the **Part Set** view, right-click and select **Create** > **Part Set** from the context menu.
 - b. Name the part sets **Var1** and **Var2**.
- 3. Group common and unique parts by dragging-and-dropping parts from the Part view onto the part set.

Var 1:

- Center_Rail_Connectors_var1_000484
- CenterInner_A_000428_Safety
- CenterOuter_A_000429_Safety

Var2:

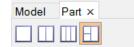
- Center_Rail_Connectors_var2_000485
- CenterInner_var2_A_000431_Safety
- CenterOuter_var2_A_000432_Safety



Step 9: Create Configurations

Create configurations Var1 and Var2 for part sets Var1 and Var2 in the Configuration view.

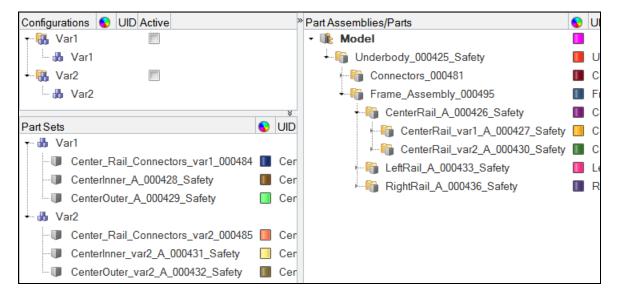
1. In the **Part** browser, enable the **Configuration** view.



2. Create two configurations.



- 3. In the **Part Set** view, right-click and select *Create* > *Configuration* from the context menu.
- 4. Name the configurations **Var1** and **Var2**.
- 5. Group part sets that are unique by dragging-and-dropping part sets from the Part Set view onto the configuration.
 - a. Group the Var1 part set into the Var 1 configuration.
 - b. Group the Var2 part set into the Var 2 configuration.



Step 10: Activate the Var 2 Configuration

1. In the **Part** browser's **Configuration** view, **Active** column, enable the checkbox for **Var 2**.

All of the parts, part assemblies, components, and part sets not associated with Var 2 become inactive.

Configurations 📀 UID Active	» Part Assemblies/Parts	0	UID	Revision Representation	Active
📲 🚯 Var1 📃	• 🎼 Model				
🔐 🍓 Var1	Underbody_000425_Safety		Underbody	А	
🕶 强 Var2 🛛 🔽	Connectors_000481	L	Connectors	А	
👪 Var2	← 🛍 Center_Rails_000482		Center_Rails	А	
*	Center_Rail_Connectors_var1_000484	L	Center_Rail_Connectors_var1	A Connector	
Part Sets 🕒 UID	Center_Rail_Connectors_var2_000485		Center_Rail_Connectors_var2	A Connector	
- 🐻 Var1	⊷i Longitudinal_Rails_000497	L	Longitudinal_Rails	А	
Center_Rail_Connectors_var1_000484	Frame_Assembly_000495		Frame_Assembly	Α	
CenterInner_A_000428_Safety	CenterRail_A_000426_Safety		CenterRail_A	А	
CenterOuter_A_000429_Safety	← 🛅 CenterRail_var1_A_000427_Safety		CenterRail_var1_A	Α	
+ 👪 Var2	CenterInner_A_000428_Safety	L	CenterInner_A	A3 NVH 15mm	
Center_Rail_Connectors_var2_000485	CenterOuter_A_000429_Satety		CenterOuter_A	A3 NVH 15mm	
CenterInner_var2_A_000431_Safety Cer	CenterRail_var2_A_000430_Safety	L	CenterRail_var2_A	Α	
CenterOuter_var2_A_000432_Safety CenterOuter_var2_A_000432_Safety	⊷ 🛍 LeftRail_A_000433_Safety		LeftRail_A	А	
	RightRail_A_000436_Safety	L	RightRail_A	А	



Step 11: Export Assembly as a Solver Deck

- 1. Open the **Export Solver Deck** tab by clicking *File > Export > Solver Deck* from the menu bar.
- 2. In the File field, enter frame_var2_model.fem.
- 3. Under Export Options:
 - Set **Export** to **Custom** to ensure that inactive parts are not written to the solver deck.
 - Under **Comments**, select the **Part Assemblies/Parts** checkbox.
- 4. Click *Export*.
- 5. Save the model as frame_assembly.hm.

Step 12: Import Assembly Solver Deck

- 1. Start a new HyperMesh Desktop session.
- Open the Import Solver Deck tab by clicking File > Import > Solver Deck from the menu bar.
- 3. In the File field, locate the frame_var2_model.fem solver deck.
- 4. Click Import.
- 5. In the **Part** browser, verify that the BOM was imported correctly.

Note: All part assembly and part metadata in the original model should be present, with the exception of the Representation name.

Step 13: Import Realizations

- 1. Open the **Import Model** tab.
- 2. Click *P*, then open the Realizations.hm file.
- 3. The Spotweld component, in the Realizations.hm file, references a material that has the same ID as a material that already exists in the current session, therefore under **Entity Management**, set **Materials** to *Keep Existing Attributes*.

Name	Value
Solver Keyword	PLSOLID
Name	Spotwelds
ID	500
Color	
Include	[Master Model]
Defined	
Card Image	PLSOLID
Material	(10) Steel
User Comments	Hide In Menu/Export



4. Click *Import*. Connector parts are imported.

Step 14: Realize Connectors

- 1. In the **Part** browser, right-click on the Spotwelds component and select **Make Current** from the context menu.
- 2. In the **Part** browser, right-click on the Longitudinal_Rail_Connectors and select **Hide** from the context menu. The display of the component's connectors is turned off in the graphics area enabling you to get a better visual of each component's connectors.
- 3. Open the **Connector** browser by clicking **View** > **Browsers** > **HyperMesh** > **Connectors** from the menu bar.
- 4. In the **Connector Entity** browser, select the *acm* (*shell gap*) connector folder.
- 5. In the Entity Editor, set Property Script to *no/skip post script*.
 - **Note:** Connector links are defined via Parts to ensure that connectors realize even if you, accidentally, renumber all of the entities in the model.

Entities	*	Layer	Tolerance	Lin	4	Lin	k2	Link
🗆 📑 ac	m (shell gap) (136)							
	100000	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100001	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100002	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100003	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100004	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100005	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100006	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100007	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100008	2	20.0		CenterOuter_A_000429_Safety		CenterInner_A_000428_Safety	
	100009	2	20.0		CenterOuter_A_000429_Safety		CenterOuter_var2_A_000432_Safety	,
	100010	2	20.0		CenterOuter_A_000429_Safety		CenterOuter_var2_A_000432_Safety	,
	100011	2	20.0		CenterOuter_A_000429_Safety		CenterOuter_var2_A_000432_Safety	,
	100012	2	20.0		CenterInner_var2_A_000431_Safety		CenterInner_A_000428_Safety	
	100013	2	20.0		CenterInner_var2_A_000431_Safety		CenterInner_A_000428_Safety	
	100014	2	20.0	100	Contestance use? A 000421 Cototu	100	Contestance & 000420 Cototo	

- 6. In the **Connector Entity** browser, select all of the connectors.
- 7. Right-click on the selected connectors and select *Rerealize* from the context menu.
- 8. In the **Part** browser, right-click on the Spotwelds part and select **Isolate Only** from the context menu. Verify that the realized FE resides in the Spotwelds component.

Step 15: Renumber Nodes and Elements

- 1. Open the **ID-Manager** by clicking *Tools* > *ID-Manager* from the context menu.
- 2. In the **ID-Manager**, select *Components*, *Properties*, and *Materials* then right-click and select *Exclude* from the context menu.

Enti	ties			ID	Excluded	Min N
	<u>.</u>	Ma	ster Model	0		
		E.	Nodes			
		Ð	Elements			
		8	Components			
		5	Properties		*	
	·	1	Materials			



3. For the Master Model, enter 1,000,000 in the **Min** field and 1,500,000 in the **Max** field.

Enti	ties		ID Excluded	Min	Мах	#0verflow	Min Reserved Max Re
	•÷	Master Model	0	1000000	1500000	24682	
		🙀 Nodes		1000000	1500000	12671	
		🙀 Elements		1000000	1500000	12011	
		😂 Components	*				
		😂 Properties	*				
		🙀 Materials	*				

Correct ID overflow by right-clicking on the Master Model and selecting *Correct* > *Overflow* from the context menu.

Step 16: Run the Model Checker

- 1. Open the **Model Checker** by clicking **Tools** > **Model Checker** > **OptiStruct**.
- 2. In the **Model Checker**, right-click and select *Run* from the context menu.
- 3. Verify that the model is error free.

Step 17: Export the Solver Deck

- 1. From the menu bar, click *File* > *Export* > *Solver Deck*.
- In the Export Solver Deck tab, File field, enter the file name frame_var2_assembled.fem.
- 3. Under Export options, Comments, select the *Part Assemblies/Parts* checkbox.
- 4. Click *Export*.

