



Altair

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**HyperWorks**

Altair HVVH Tutorials 2019




HVVH-4000: CAD Tab

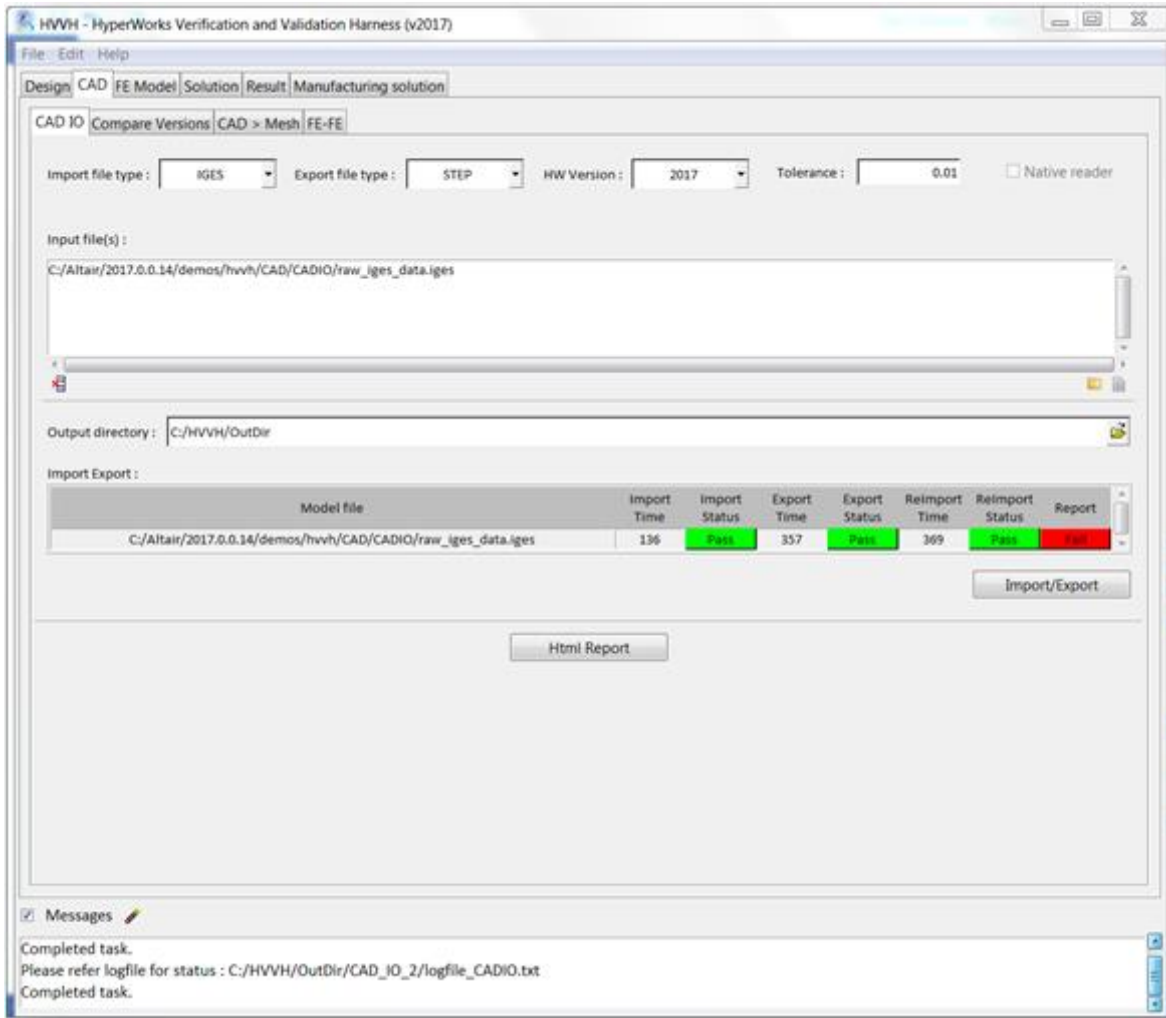
[altairhyperworks.com](http://altairhyperworks.com)

In this tutorial, you will learn how to use the four sub-tabs that comprise the CAD tab by:

- Comparing CAD geometry (CAD IO)
- Comparing CAD geometry across different Altair HyperMesh versions (Compare Versions)
- Comparing the original CAD geometry and an FE mesh after meshing in Altair HyperMesh (CAD > Mesh)
- Comparing Meshed FE geometry across different HM versions (FE-FE)

### Step 1: Compare CAD geometry (CAD IO tab).

1. From the **Start** menu, select **All Programs > Altair HyperWorks 2017 > Tools > HyperWorks Verification and Validation Harness**.
2. Select the **CAD** tab, followed by the **CAD IO** tab.
3. From the **Import file type:** drop-down menu, select the **Import file type IGES**.
4. From the **Export file type:** drop-down menu, select **STEP**
5. For **HW Version**, select **2017**.
6. Leave **Tolerance** as the default (.01).
7. Under the **Input File** field, click the file folder icon, , to search for and load additional input files.
8. Click the add file icon, , to display the file browser and load the `raw_iges_data.iges` file from the following location: `..\tutorials\hvvh\CAD\CADIO`.
9. For the **Output directory** field, use the open file icon, , to select an output directory.
10. Click **Import/Export**.
11. A report is generated based on the model re-import and comparison with the original CAD geometry, a CAD-CAD comparison. Model file import and export times, as well as import and export status are displayed.



In the **Messages** window, the run details are displayed along with the log file location. If a difference is greater than the tolerance, it is indicated as **Fail**, otherwise shown to **Pass**.

12. Click **HTML Report** to generate a detailed CAD IO report, similar to this:

<b>HyperWorks Verification and Validation Harness</b>							
<b>CAD - CAD IO Report</b>							
Import File Type : IGES		Export File Type : STEP		HW Version : 2017 ;		Tolerance : 0.01	
Model file	Import Time	Import Status	Export Time	Export Status	Reimport Time	Reimport Status	Report
C:/Altair/2017.0.0.14/demos/hvvh/CAD/CADIO/raw_iges_data.iges	136	Pass	357	Pass	369	Pass	Fail

**Entity comparison**

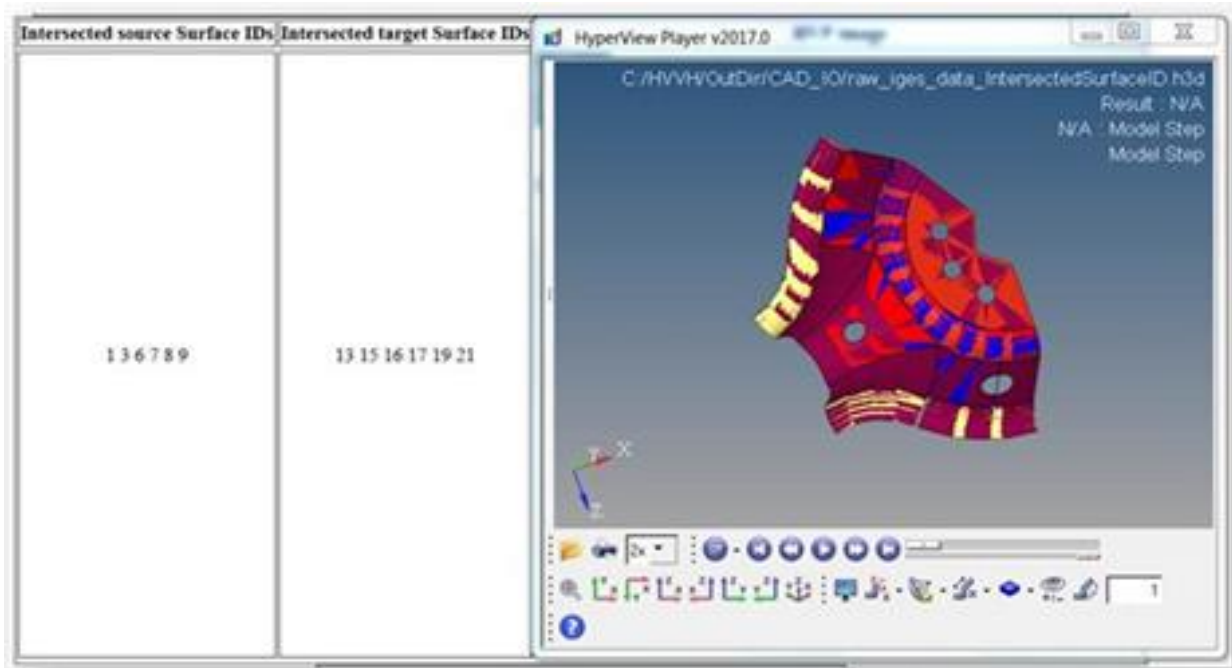
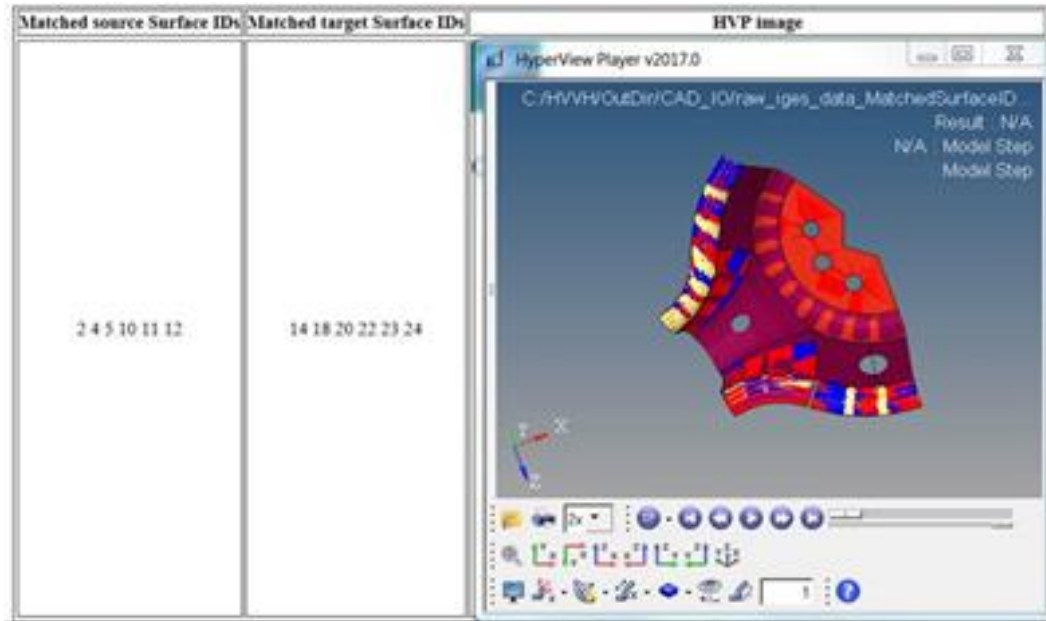
Entity Counts	Current version	Reference version	Diff	Status
Points	8	8	0	Pass
Lines	0	0	0	Pass
Solids	0	0	0	Pass
Surfaces	12	12	0	Pass
Assemblies	0	0	0	Pass
Components	4	1	3	Fail

**Area comparison**

Type	Current entities	Reference entities
Matched area	49.507	51.293
Overlapped area	0.000	0.000
Intersected area	50.493	48.707
Unmatched area	0.000	0.000

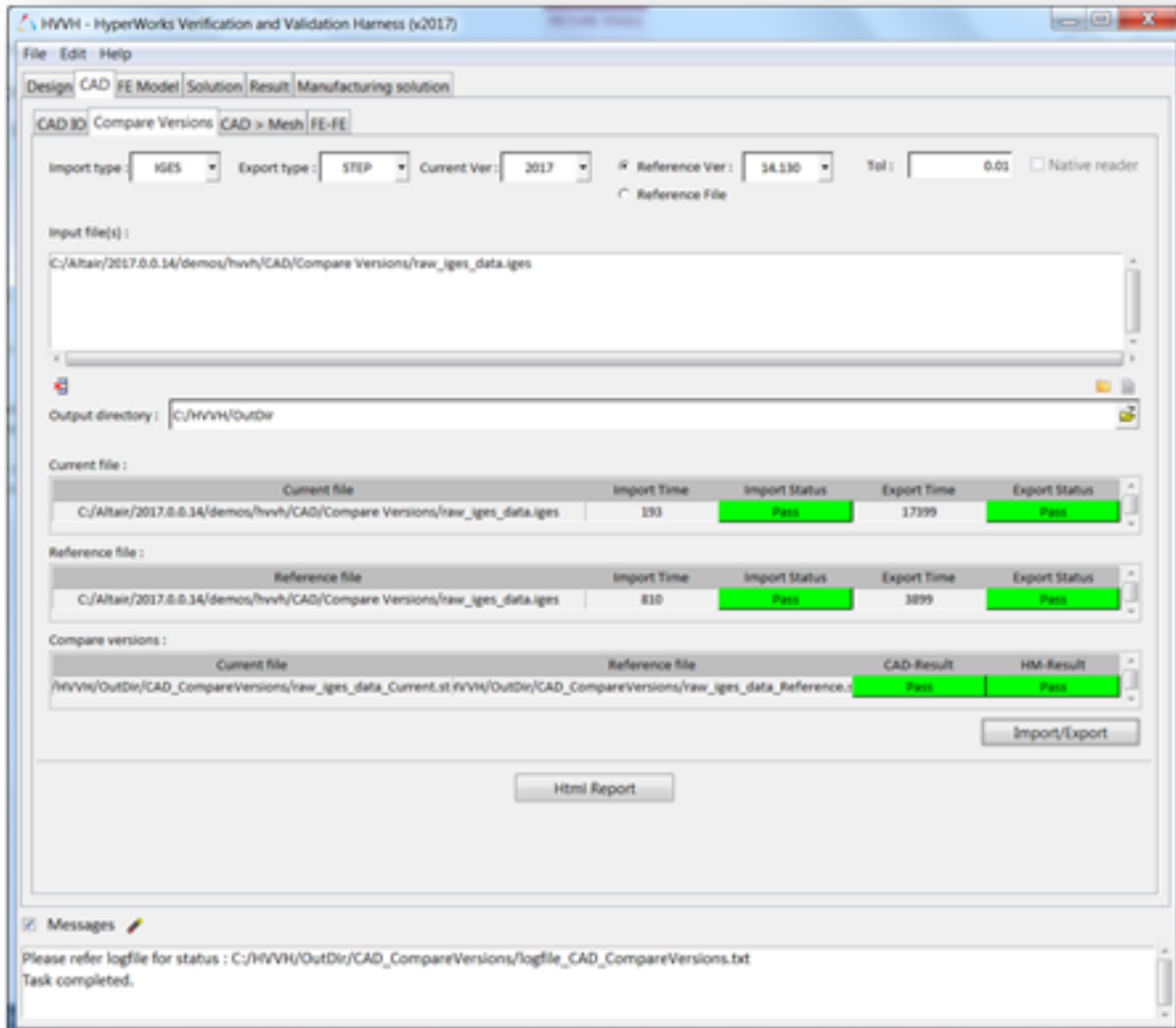
**Surface Area Comparison**




Current Surface	Reference Surface	Diff	Status
Id:1 Area:229.0901	Id:13 Area:229.3568	-0.2667	Fail
Id:2 Area:248.7254	Id:14 Area:248.7069	0.0185	Fail
Id:3 Area:98.6720	Id:15 Area:98.7232	-0.0512	Fail
Id:4 Area:116.4741	Id:16 Area:0.1241	116.3500	Fail
Id:5 Area:113.2685	Id:17 Area:98.6796	14.5889	Fail
Id:6 Area:173.2177	Id:18 Area:113.0797	60.1380	Fail
Id:7 Area:191.6013	Id:19 Area:191.2613	0.3400	Fail
Id:8 Area:98.6720	Id:20 Area:116.4690	-17.7970	Fail
Id:9 Area:59.3472	Id:21 Area:173.2655	-113.9183	Fail
Id:10 Area:81.8569	Id:22 Area:81.4027	0.4542	Fail
Id:11 Area:97.2923	Id:23 Area:98.0190	-0.7267	Fail
Id:12 Area:176.3782	Id:24 Area:175.7462	0.6320	Fail



## Step 2: Compare CAD geometry across different Altair HyperMesh versions (Compare Versions tab).

1. Select the **Compare Versions** tab.



2. From the **Import file type:** drop-down menu, select the **Import file type IGES**.
3. From the **Export file type:** drop-down menu, select **STEP**.
4. For **Current Version**, select **2017**.
5. For **Reference Version**, select **14.0.0.130**.
6. Leave **Tolerance** as the default (.01).
7. Under the **Input File** field, click the file folder icon, , to search for and load additional input files.
8. Click the add file icon, , to display the file browser and load the raw\_iges\_data.iges file from the following location: ..\tutorials\hvvh\CAD\CompareVersions.
9. For the **Output directory** field, use the open file icon, , to select an output directory.
10. Click **Import/Export**.
11. A report is generated based on the comparison of exported CAD geometry in the current and reference versions and CAD-CAD comparison. Model file import and export times, as

well as import and export status are displayed for both the current and reference versions.

In the **Messages** window, the run details are displayed along with the log file location.

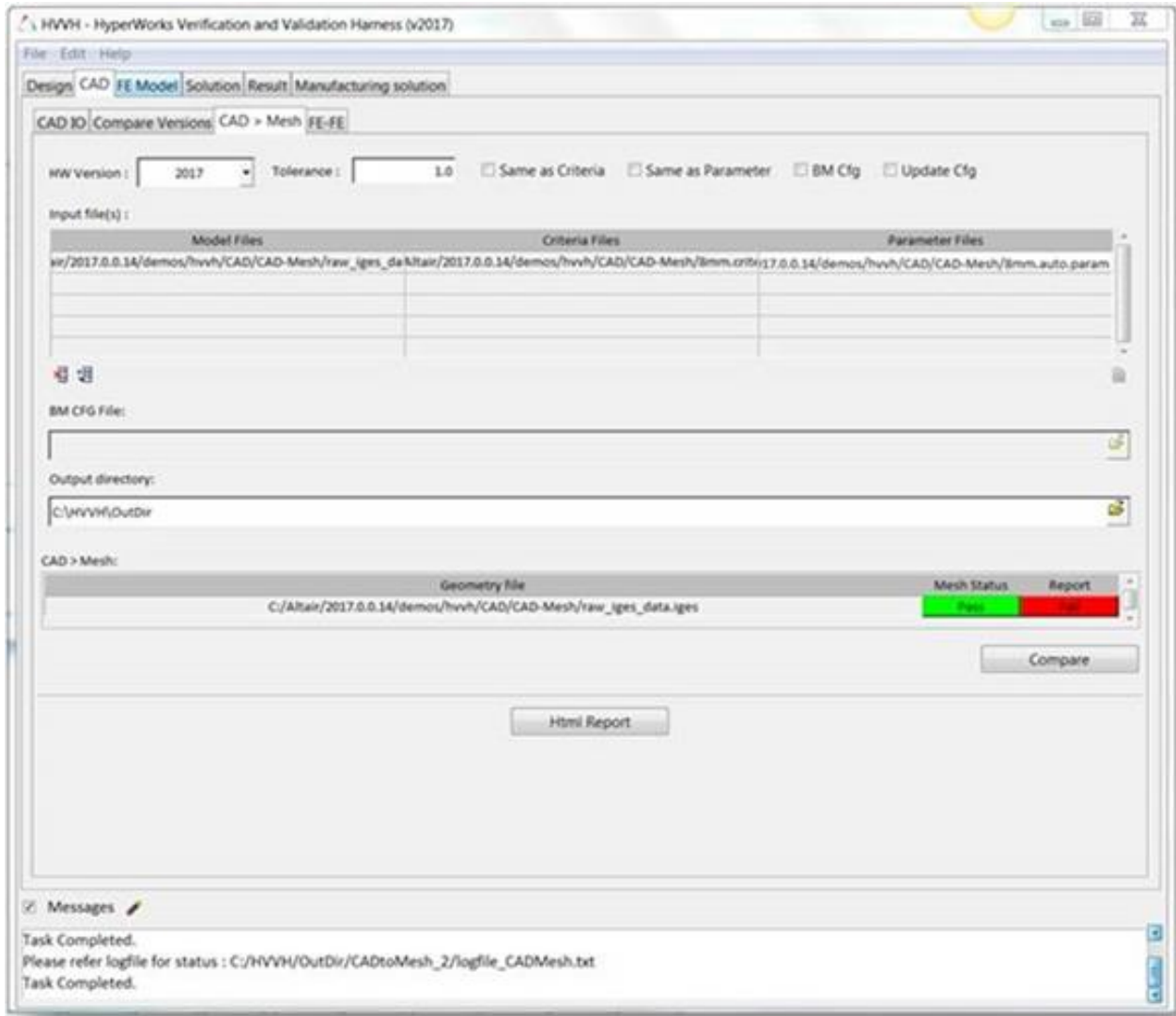
If a difference is greater than the tolerance, it is indicated as **Fail**, otherwise shown to **Pass**.



- Click **HTML Report** to generate a detailed report of the CAD version comparison operations, similar to this:

<u>HyperWorks Verification and Validation Harness</u>					
<u>CAD - Compare Versions Report</u>					
Import File Type : IGES	Export File Type : STEP	Current Version : 2017	Reference Version : 14.130	Tolerance : 0.01	
Current File :					
Current file	Import Time	Import Status	Export Time	Export Status	
C:/Altair/2017.0.0.14/demos/hvvh/CAD/Compare Versions/raw_iges_data.iges	193	Pass	17399	Pass	
Reference File :					
Reference file	Import Time	Import Status	Export Time	Export Status	
C:/Altair/2017.0.0.14/demos/hvvh/CAD/Compare Versions/raw_iges_data.iges	810	Pass	3899	Pass	
Compare Versions :					
Current file	Reference file	CAD-Result	HM-Result		
C:/HVVH/OutDir/CAD_CompareVersions/raw_iges_data_Current.step	C:/HVVH/OutDir/CAD_CompareVersions/raw_iges_data_Reference.step	Pass	Pass		



### Step 3: Compare original CAD geometry and an FE mesh after meshing in Altair HyperMesh (CAD > Mesh tab).

- Select the **CAD > Mesh** tab.



2. From the **Import file type:** drop-down menu, select the **Import file type IGES**.
3. From the **Export file type:** drop-down menu, select **STEP**.
4. For **Current Version**, select **2017**.
5. Leave **Tolerance** as the default (.01).
6. Leave the following options blank: **Same as Criteria**, **Same as Parameter**, **BM Cfg**, and **Update Cfg**.
7. To select the Model File under the **Input File** heading, click the add file icon, , to display the file browser and load the raw\_iges\_data.iges file from the following location: ..\tutorials\hvvh\CAD\CAD-Mesh.
8. To select the Criteria File under the **Input File** heading, click the add file icon, , to display the file browser and load the 8mm.criteria file from the following location: ..\tutorials\hvvh\CAD\CAD-Mesh.



9. To select the Parameter File under the **Input File** heading, click the add file icon, , to display the file browser and load the 8mm.auto.param file from the following location:  
`..\tutorials\hvvh\CAD\CAD-Mesh.`
10. For the **Output directory** field, use the open file icon, , to select an output directory.
11. Click **Compare**.
12. In the background, a CAD model is imported in Altair HyperMesh and it is meshed based on the selected criteria and parameter files.
13. A report is generated based on the comparison of CAD geometry and the meshed FE model CAD-Mesh comparison. The mesh status is displayed and any issues are displayed as **Fail**.  
 In the **Messages** window, the run details are displayed along with the log file location.
14. Click **HTML Report** to generate a detailed report of the CAD > Mesh comparisons, similar to this:

## HyperWorks Verification and Validation Harness

### CAD - CAD Mesh Report

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HW Version : 2017

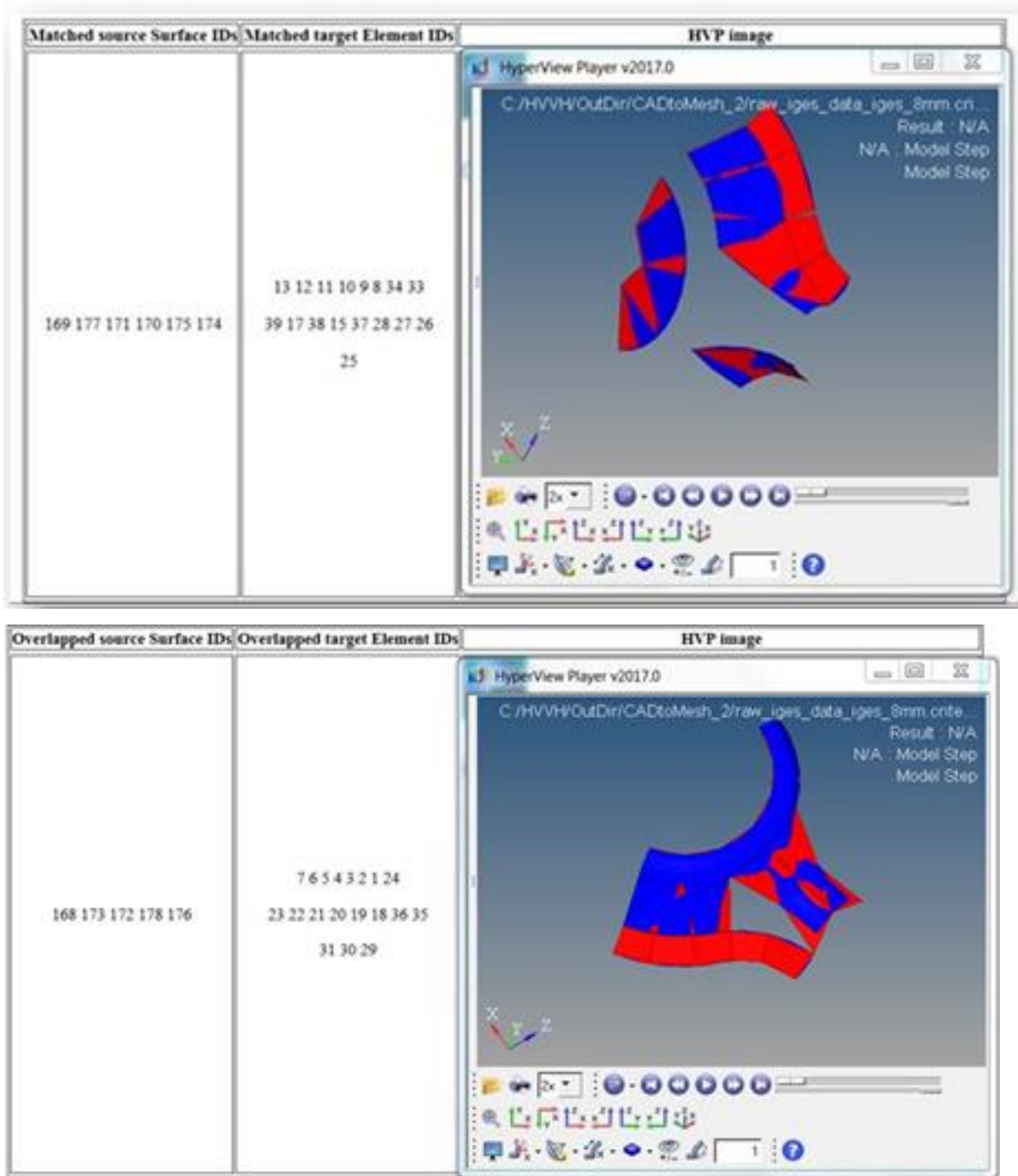
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### No Error in BM

Geometry file	Mesh Status	Report
C:/Altair/2017.0.0.14/demos/hvvh/CAD/CAD-Mesh/raw_iges_data.iges	Pass	Fail

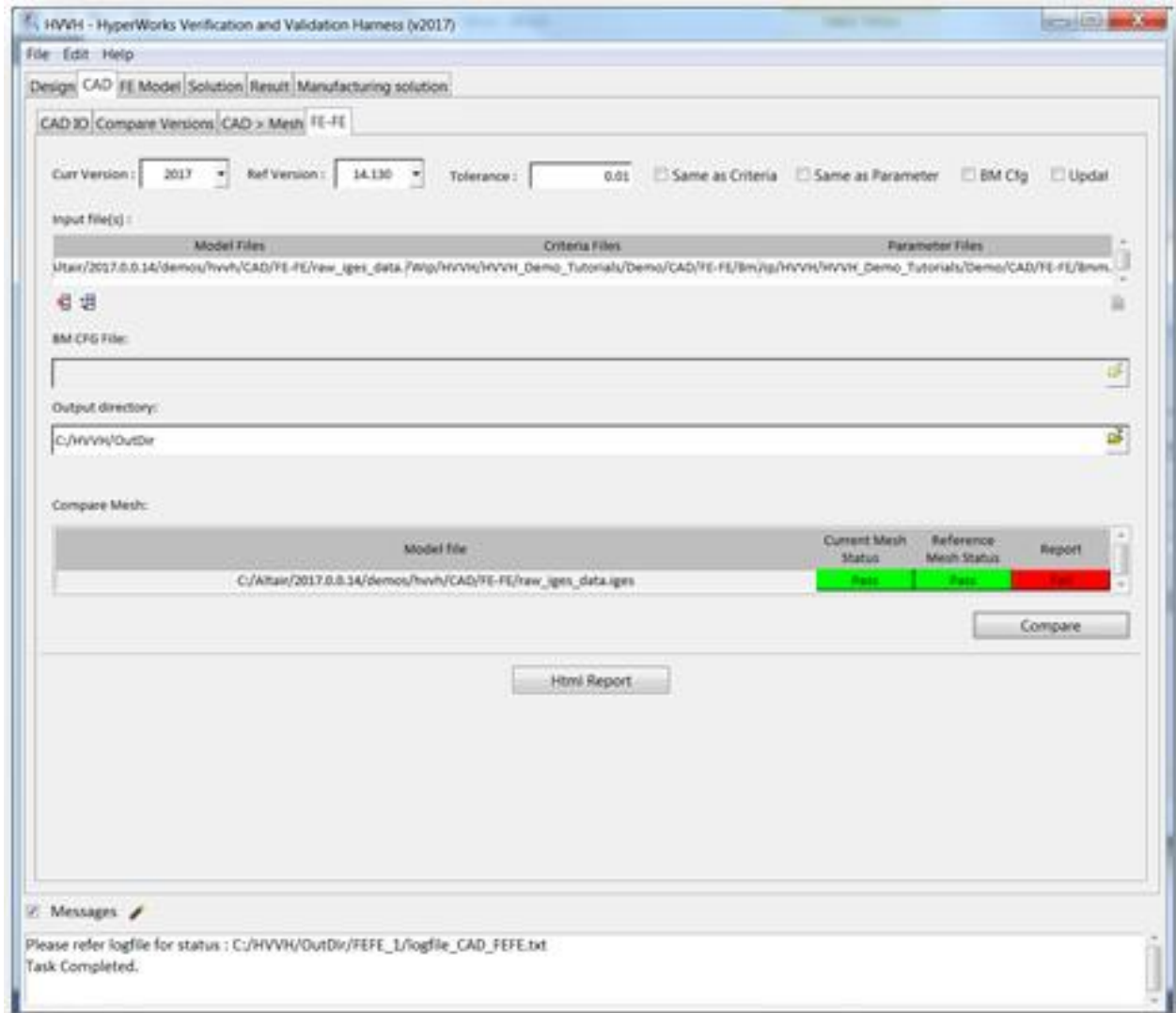
### Area comparison



Type	Current entities	Reference entities
Matched area	52.348	49.943
Overlapped area	47.652	50.057
Intersected area	0.000	0.000
Unmatched area	0.000	0.000





#### Step 4: Compare meshed FE geometry across different versions of Altair HyperMesh (FE > FE tab).

1. Select the **FE > FE** tab.



2. From the **Import file type:** drop-down menu, select the **Import file type IGES**.
3. From the **Export file type:** drop-down menu, select **STEP**.
4. For **Current Version**, select **2017**.
5. For **Reference Version**, select **14.0.0.130**.
6. Leave **Tolerance** as the default (.01).
7. Leave the following options blank: **Same as Criteria**, **Same as Parameter**, **BM Cfg**, and **Update Cfg**.
8. To select the Model File under the **Input File** heading, click the add file icon, , to display the file browser and load the raw\_iges\_data.iges file from the following location: ..\tutorials\hvvh\CAD\FE-FE.
9. To select the Criteria File under the **Input File** heading, click the add file icon, , to display the file browser and load the 8mm.criterias file from the following location: ..\tutorials\hvvh\CAD\FE-FE.

10. To select the Parameter File under the **Input File** heading, click the add file icon, , to display the file browser and load the 8mm.auto.param file from the following location:  
`..\tutorials\hvvh\CAD\FE-FE.`
11. For the **Output directory** field, use the open file icon, , to select an output directory.
12. Click **Compare**.
13. In the background, a CAD model is imported in Altair HyperMesh and it is meshed based on the selected criteria and parameter files.
14. A report is generated based on the comparison of the meshed FE models (FE-FE). The mesh status is displayed and any issues are displayed as **Fail**.  
 In the **Messages** window, the run details are displayed along with the log file location.
15. Click **HTML Report** to generate a detailed report of the FE-FE comparison, similar to this:

<b><u>HyperWorks Verification and Validation Harness</u></b>				
<b><u>CAD - FE FE Report</u></b>				
Current HW Version : 2017		Reference HW Version : 14.130		
<b><u>No Error in BM</u></b>				
Model file	Current Mesh Status	Reference Mesh Status	Report	
C:/Altair/2017.0.0.14/demos/hvvh/CAD/FE-FE/raw_iges_data.iges	Pass	Pass	Fail	
<b><u>Quality Index</u></b>				
Parameter	Current Lower Bound	Reference Lower Bound	Current Upper Bound	Reference Upper Bound
aspect	1.0347658854141828	1.0347658854141828	2.1985851615499232	2.1985851615499232
chordaldev	4.687428401686771e-13	4.687428401686771e-13	1.2822842673930326	1.2822842673930326
jacobian	0.5665235295369438	0.5665235295369438	1.0	1.0
length	4.854070394838243	4.854070394838243	6.963287666487066	6.963287666487066
maxinterangle	61.69545529470277	61.69545529470277	120.72288469587633	120.72288469587633
mininterangle	27.113812582022017	27.113812582022017	89.93812781871571	89.93812781871571
skew	0.03310943270425071	0.03310943270425071	41.3315206164711	41.3315206164711
taper	0.0	0.0	0.4767652343347676	0.4767652343347676
warpage	0.0	0.0	16.378264766143843	16.378264766143843

## Area comparison

Type	Current entities	Reference entities
Matched area	100.000	100.000
Overlapped area	0.000	0.000
Intersected area	0.000	0.000
Unmatched area	0.000	0.000

Matched Current Element IDs	Matched Reference Element IDs
13 12 11 10 9 8 7 6	
5 4 3 2 1 34 33 39	
24 23 22 21 20 19 18 17	88 87 86 85 84 83 82 81
38 15 37 36 35 31 30 29	80 79 78 77 76 106 105 111
28 27 26 25 52 51 50 49	97 96 95 94 93 92 91 90
48 47 46 45 44 43 42 41	110 89 109 108 107 104 103 102
40 70 69 75 61 60 59 58	101 100 99 98
57 56 55 54 74 53 73 72	
71 68 67 66 65 64 63 62	

HyperView Player v2017.0  
 C:/HVVH/OutDir/FEFE/raw\_iges\_data\_iges\_8mm\_criteria\_8mm\_auto\_para...  
 Result : N/A  
 N/A : Model Step  
 Model Step