



Elysium
3DxSUITE™

Elysium 3DxSUITE
Validation Configurator Manual

September 2022

Elysium Co. Ltd.

Index

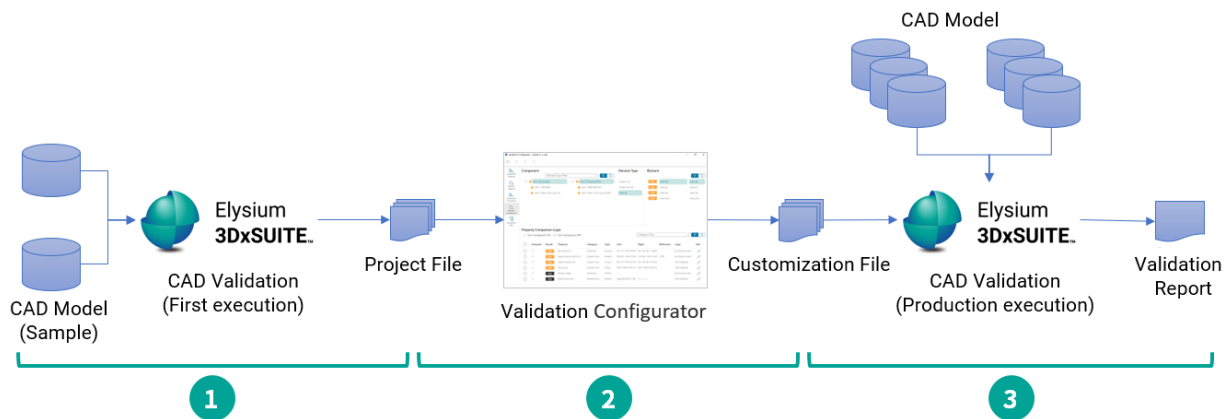
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1. Introduction

3DxSUITE Validation Configurator (hereinafter referred to as "Validation Configurator") is an application for editing Customization Files used by 3DxSUITE CAD Validator.

CAD Validator gives you the flexibility to customize validations and mappings by specifying the Customization File. Validation Configurator is an application that makes customizing CAD Validator easier.



Steps to customize validation settings of CAD Validator

1. Prepare two sample models (Source file and Target file) to compare. Specify the parameter "CreateVcProjectFile=1" and run CAD Validator. Validation Configurator Project File (*.vcpf) is output.
 - To edit the validation settings while reviewing the validation result, select the model that produces the differences that you want to customize.
 - It is recommended to select a model with a smaller file size among the models meeting the criteria. Selecting a model with a larger file size slows down the response when updating the preview on Validation Configurator.
2. Import the Validation Configurator Project File into Validation Configurator and edit the validation settings. After editing, export the Customization File.
3. Specify the Customization File exported in step 2 to the parameter "CustomizeFolder", and run CAD Validator.
 - The Customization File created in step 2 can be used for any validation.



- Refer to "Elysium 3DxSUITE Component Manual" for more details on CAD Validator.
- And refer to "Validator_ComparablePropertiesTable.pdf" for details about validation categories.
 - "Validator_ComparablePropertiesTable.pdf" is included in "<3DxSUITE Base Package>\doc\Component\Validator".
- Please note that CAD Validator and Report Creator licenses are required to try the tutorials described in this manual.

2. Try Validation Configurator

2.1. Preparation

Please ensure to install the following products beforehand:

- 3DxSUITE SmartLauncher
- 3DxSUITE Validation Configurator
- 3DxSUITE ScenarioEditor

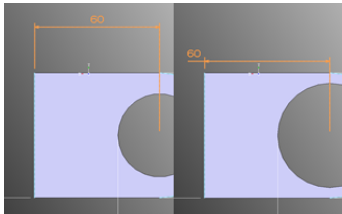
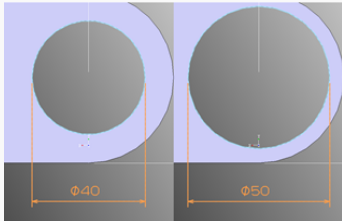
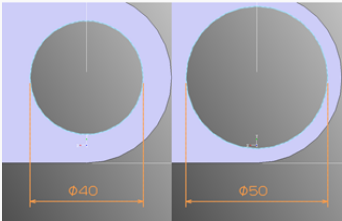
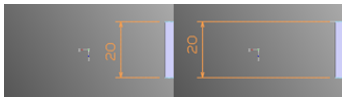
Refer to "Elysium 3DxSUITE Installation Guide" for the installation procedure.

2.2. What To Do in this Chapter

The following models are used in this chapter.

- QuickStart\sample_A-1.enf
- QuickStart\sample_A-2.enf

When compared with the default setting, three dimensional differences are detected. Out of the three, one is "dimension with difference in dimension value" and the other two are "dimension with difference in position". In this chapter, customize the comparison settings to only detect differences in dimension values (dimension with difference in dimension value) as shown in the table below.

Dimension	By Default Settings	After Customization
Dimension.2		Not Detected
Dimension.3		
Dimension.4		Not Detected

2.3. Procedure

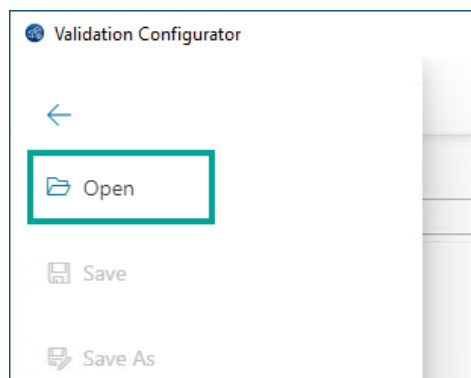
1. Use SmartLauncher to output the Validation Configurator Project File.
 - Run CAD Validator with the following parameters. A validation report (3D HTML) and a Validation Configurator Project File are created in the output folder.

```
[GEOMDIFF]
CreateVcProjectFile=1
Create3DReport=1
```

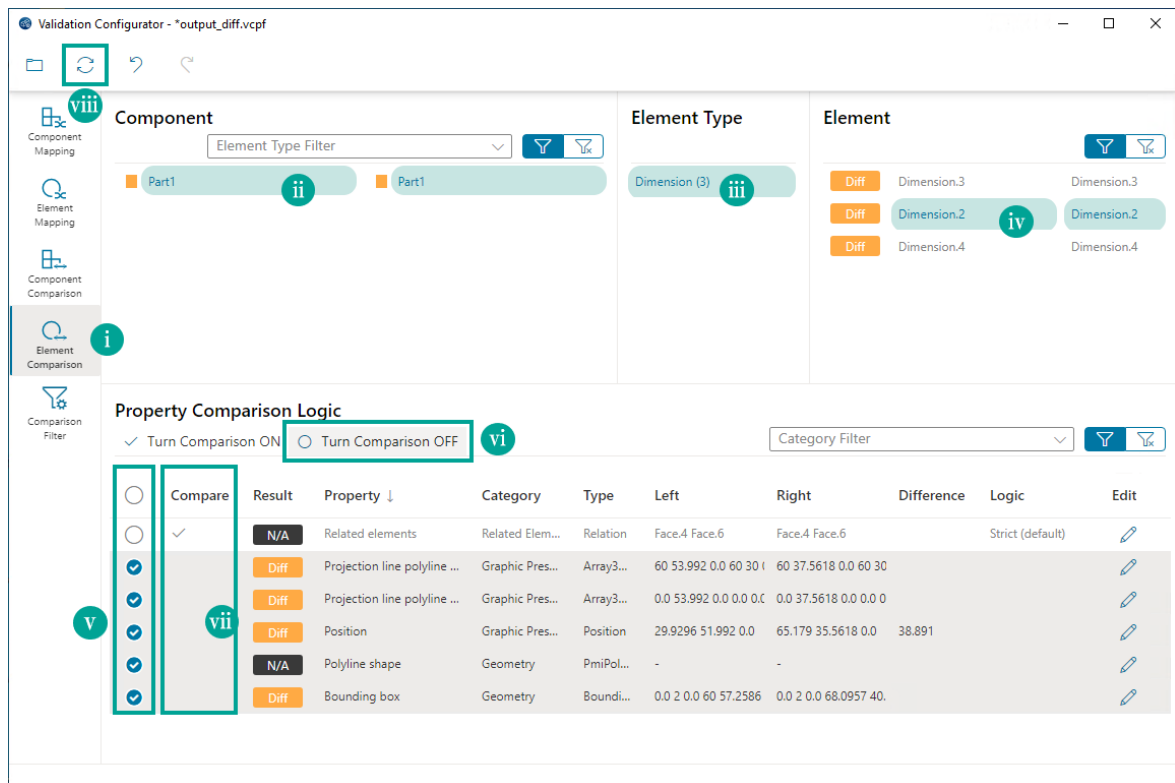


Before executing CAD Validator with SmartLauncher, create a Scenario including the execution of CAD Validator with ScenarioEditor, and then select [Run Scenario] of SmartLauncher to run the created Scenario.

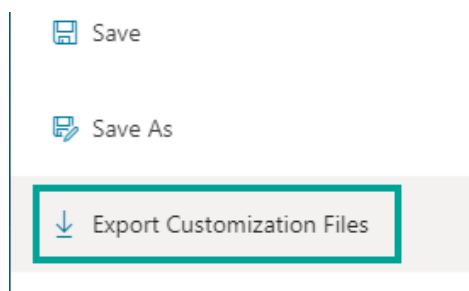
2. Review the validation report output with the default settings.
 - Open the output validation report, and confirm the three detected dimensional differences.
 - When editing validation settings using Validation Configurator in the following steps, it is recommended to look at the validation report as you work your way through.
3. Launch Validation Configurator.
 - After launching Validation Configurator, open the Validation Configurator Project File you just created.



4. Edit the validation settings. The procedure is as follows:



- i. Select [Element Comparison] in the navigation window.
 - ii. Select the part called "Part1".
 - iii. Select a dimension.
 - iv. Select "Dimension.2".
 - v. Select a property other than "Related elements".
 - vi. Select [Turn Comparison OFF].
 - vii. Confirm that the property selected in v. has "Compare" column turned OFF.
 - viii. Press [Update Preview] (↻). Confirm that only "Dimension.3" is displayed in Element list.
5. Export the Customization File.
 - After customization, select [Export Customization Files] from the File menu to export the Customization File.



- When exporting, you will be requested to specify a folder. Please ensure to specify an empty folder.

- After exporting, the following three files are output to the specified folder:
 - cadvalidator.prm
 - customize_table.csv
 - customize_utility.rb

6. Run validation using the Customization File.

- Set the path of the folder (Customize Folder) where the three files exported in step 5 are located to the following parameters in CAD Validator:

```
[GEOMDIFF]  
CustomizeFolder={Customize Folder}
```

- Run the Scenario with SmartLauncher including the above parameters and the parameter settings contained in cadvalidator.prm. Then output the validation report.
- Make sure that the validation report reflects the result you customized in Validation Configurator. In this sample, confirm that the number of detected dimensional difference is 1.



Please note that contents of "cadvalidator.prm" inside Customize Folder are not reflected in the CAD Validator process even if the parameter "CustomizeFolder" is set. As mentioned above, the contents of "cadvalidator.prm" also need to be set in the Scenario.

3. Preknowledge

This chapter will explain about the things you need to know before starting Validation Configurator.

3.1. Process of CAD Validator

This section will explain about the process of CAD Validator, which is the target of customization by Validation Configurator.

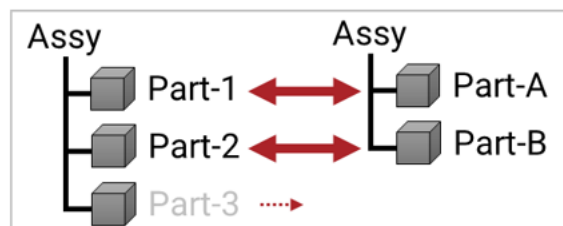
CAD Validator detects differences between models by following these steps:

1. Mapping between Components
2. Mapping between Elements
3. Comparison between mapped Components / Elements
4. Comparison between assembly configurations
5. Geometry comparison between parts
6. Comparison of geometry attributes (color, etc.) between parts

Validation Configurator supports customization of comparisons for step 1 to 3; however, step 4 to 6 are not supported.

Details of step 1 to 3 are as follows.

3.1.1. Mapping between Components



Map the parts / assemblies of the two models.

Mapping is determined by the "Score" calculated by the matching degree of properties, such as the name of the part / assembly, the part number, and the size of bounding box.

- Pure Score
Score calculated by comparison logic of each property. Comparison logic can be changed.
- Weight
Coefficient for weighing each property. Weight value can be changed.
- Score
Pure Score multiplied by the Weight is the "Score". The ones with the highest Total are

mapped first.

- **Mandatory Flag**

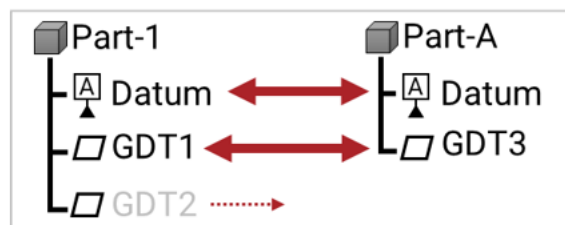
If a property with Mandatory flag has a score of "0", it will not be mapped even if other properties have higher scores.

Property	Part-1	Part-A	Score Calculation Logic	Pure Score	Weight	Score	Mandatory Flag
Bounding Box	(x,y,z) - (x,y,z)	(x,y,z) - (x,y,z)	By Degree of Overlapping Volume	0.8	1	0.8	
Geometry Type	Brep	Brep	-				
Name	Part-1	Part-A	By Similarity of Strings	0.4	2	0.8	ON
Part Number	Part-1	Part-A	By Similarity of Strings	0.4	1	0.4	
Number of Solids	1	1	-				
Number of Faces	120	140	By Degree of Changes	0.75	1	0.75	

Specify which property to use in the mapping. In the above example table, the properties for "Geometry Type" and "Number of Solids" are not used for mapping. Total Score is "2.75" which is the sum of "Score" column. Since the score for the mandatory property "Name" is not zero, Part-1 and Part-A will be mapped. If Total Scores of the other mapping candidates are less than 2.75, Part-1 and Part-A will be mapped.

Components that were not mapped at the end are determined to be added / removed Components (Add / Rem).

3.1.2. Mapping between Elements



Map the Elements included in the mapped parts.

Element Mapping is determined by the "Score" calculated by the matching degree of properties such as PMI type, Name, and PMI Bounding box.

Score is calculated in the same way as Component Mapping.

3.1.3. Comparison between Mapped Components / Elements

Compare the properties between the mapped Components or Elements.

Each property is compared by the specified comparison logic.

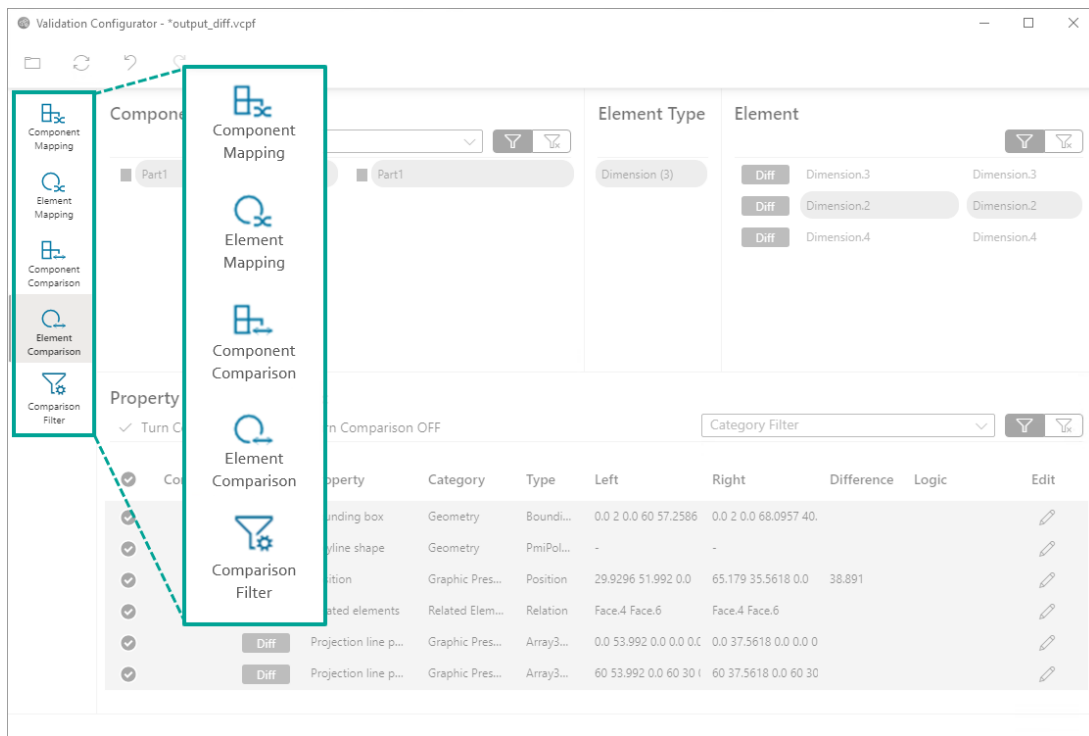
Property	Category	Dimension -1 (Part-1)	Dimension -1 (Part-A)	Comparison Logic	Compare or not	For Reference
Dimension value	Semantic Representation	2.0	3.0	By Tolerance	ON	
Dimension Type	Semantic Representation	Length Dimension	Length Dimension	Strict	ON	
Position	Graphic Presentation	(x,y,z)	(x,y,z)	By Tolerance	ON	
Font size	Graphic Presentation	9	10	-		ON
Color	Graphic Presentation	Black	Black	-		
Name	General Attribute	Dimension-1	Dimension-1	-		ON

It is possible to specify the properties you want to compare. Also, properties that are not compared are classified as "Reference", and properties for reference are described in the validation report.

As in the above example table, the property "Color" is not compared and will not be listed in the comparison report. Properties "Font size" and "Name" are not compared, but will be listed in the validation report. Properties "Dimension value", "Dimension Type", and "Position" are compared in the respective comparison logic. If there are no differences in any of the properties, this Element (Dimension-1) is considered the "Same". If there is a difference in any of the three properties, this Element (Dimension-1) is considered "Diff".

3.2. Configuration of Validation Configurator

Validation Configurator consists of five navigation views, and the icons on the left of the window can be used to switch between them.



Component Mapping

This is a view to customize "[Mapping between Components](#)". Select the property to be used for mapping, and set the weight, etc.

Element Mapping

This is a view to customize "[Mapping between Elements](#)". Select the property to be used for mapping, and set the weight, etc.

Component Comparison

This is a view to customize comparison between Components in "[Comparison between mapped Components / Elements](#)". Set the properties to be compared and their comparison logic, etc.

Element Comparison

This is a view to customize comparison between Elements in "[Comparison between mapped Components/Elements](#)". Set the properties to be compared and their comparison logic, etc.

Comparison Filter

This view is used to specify the Element Types (*1) to compare. It consists of two views, "Attribute" and "PMI". To switch views, use the tabs located in the upper left corner. Set whether to compare each Element Type (*2) or to compare the property of each Element Type by Property Category (*3).

(*1) In [Attribute] tab, Element Type refers to "System Attribute", "User Attribute", etc. In [PMI] tab, Element Type refers to "Note", "Dimension", "GD&T", etc.



(*2) Enable or disable "Compare", for example, disable "Compare" for Element Type "Note" or enable "Compare" for Element Type "Dimension".

(*3) For example, among the properties of Element Type "GD&T", Property Comparison of the Category "Graphic Presentation" is disabled, and enabled for the Category "Semantic Representation".

Validation Configurator - output_diff.vcpf

Attribute **PMI**

Summary of Element Comparison Result ⓘ

Element Type	Compare	Same	Diff	Rem	Add
Note	<input checked="" type="checkbox"/>	0	0	0	0
Datum	<input checked="" type="checkbox"/>	0	0	0	0
Datum Target	<input checked="" type="checkbox"/>	0	0	0	0
GD&T	<input checked="" type="checkbox"/>	0	0	0	0
Surface Finish	<input checked="" type="checkbox"/>	0	0	0	0
Dimension	<input checked="" type="checkbox"/>	3	1	0	0
Line Weld	<input checked="" type="checkbox"/>	0	0	0	0
Spot Weld	<input checked="" type="checkbox"/>	0	0	0	0
Locator	<input type="checkbox"/>	0	0	0	0
Symbol	<input checked="" type="checkbox"/>	0	0	0	0
Mock PMI	<input type="checkbox"/>	0	0	0	0
Other PMI	<input checked="" type="checkbox"/>	0	0	0	0
Model View	<input checked="" type="checkbox"/>	0	0	0	0

Summary of Property Comparison Result ⓘ

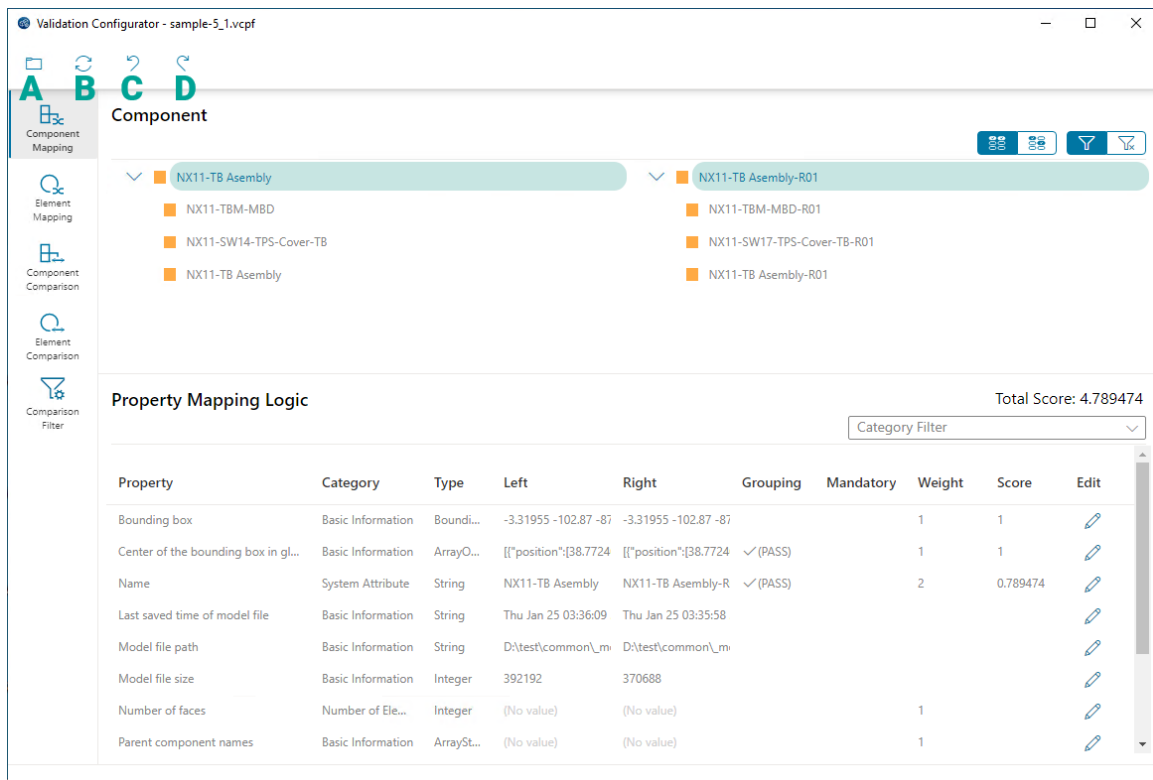
Category ↑	Compare	Same	Diff	N/A
General Attribute	<input checked="" type="checkbox"/>	12	0	0
Geometry	<input checked="" type="checkbox"/>	0	0	0
Graphic Presentation	<input checked="" type="checkbox"/>	91	1	0
Related Element	<input checked="" type="checkbox"/>	0	0	4
Semantic Representation	<input checked="" type="checkbox"/>	39	2	0

4. User Interface

This chapter will explain about the meaning and behavior of items contained in navigations, dialogs, and menus.

4.1. Navigation Window

4.1.1. Toolbar (Common)



A: File Menu

Open the File Menu.

B: Update Preview

Update the preview. It will take a little longer because CAD Validator will be running in the backend.

C: Undo

Reverse the last change done.

D: Redo

Restore one [Undo] change.

4.1.2. Component Mapping

The screenshot displays the 'Validation Configurator - sample-5_1.vcpf' window. The left sidebar contains navigation icons for Component Mapping, Element Mapping, Component Comparison, Element Comparison, and Comparison Filter. The main area is divided into two sections: 'Component' and 'Property Mapping Logic'.

Component Section: Shows two selected components: 'NX11-TB Assembly' and 'NX11-TB Assembly-R01'. Below them, a list of sub-components is shown for each, including 'NX11-TBM-MBD', 'NX11-SW14-TPS-Cover-TB', and 'NX11-TB Assembly'.

Property Mapping Logic Section: Displays a table with columns: Property, Category, Type, Left, Right, Grouping, Mandatory, Weight, Score, and Edit. The table lists various properties like 'Bounding box', 'Center of the bounding box in gl...', 'Name', 'Last saved time of model file', 'Model file path', 'Model file size', 'Number of faces', and 'Parent component names'. The 'Edit' column contains edit icons for each row.

Annotations:

- A:** Comparison Result Filter (top right)
- B:** Pair Selection Mode (top right)
- C:** Category Filter (top right)
- D:** Total Score: 4.789474 (top right)
- E:** Edit (bottom right, pointing to the Edit column)

A: Comparison Result Filter

- Show Only Diffs
Show only the Components and Elements with differences.
- Show All
Show all Components and Elements.

B: Pair Selection Mode

- Select by Mapped Pair
Select mapped Components or Elements at the same time to see their scores.
- Select Pair Manually
Select a Component or Element that was not mapped to see its score.

C: Category Filter

Filter the properties shown in the table by the selected categories.

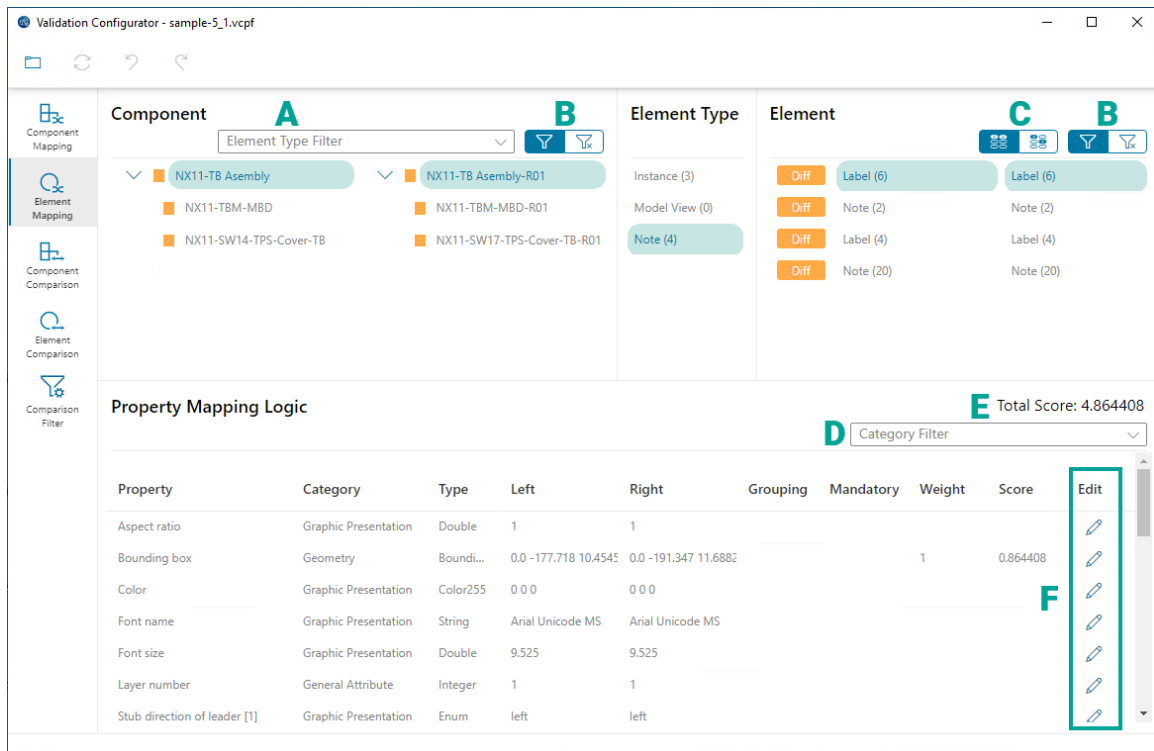
D: Total Score

Display the total score for individual property.

E: Edit

Start [Mapping Logic Edit Dialog](#) for individual property.

4.1.3. Element Mapping



A: Element Type Filter

Filter the Element Types shown in the preview.

B: Comparison Result Filter

- Show Only Diffs
Show only the Components and Elements with differences.
- Show All
Show all Components and Elements.

C: Pair Selection Mode

- Select by Mapped Pair
Select mapped Components or Elements at the same time to see their scores.
- Select Pair Manually
Select a Component or Element that was not mapped to see its score.

D: Category Filter

Filter the properties shown in the table by the selected categories.

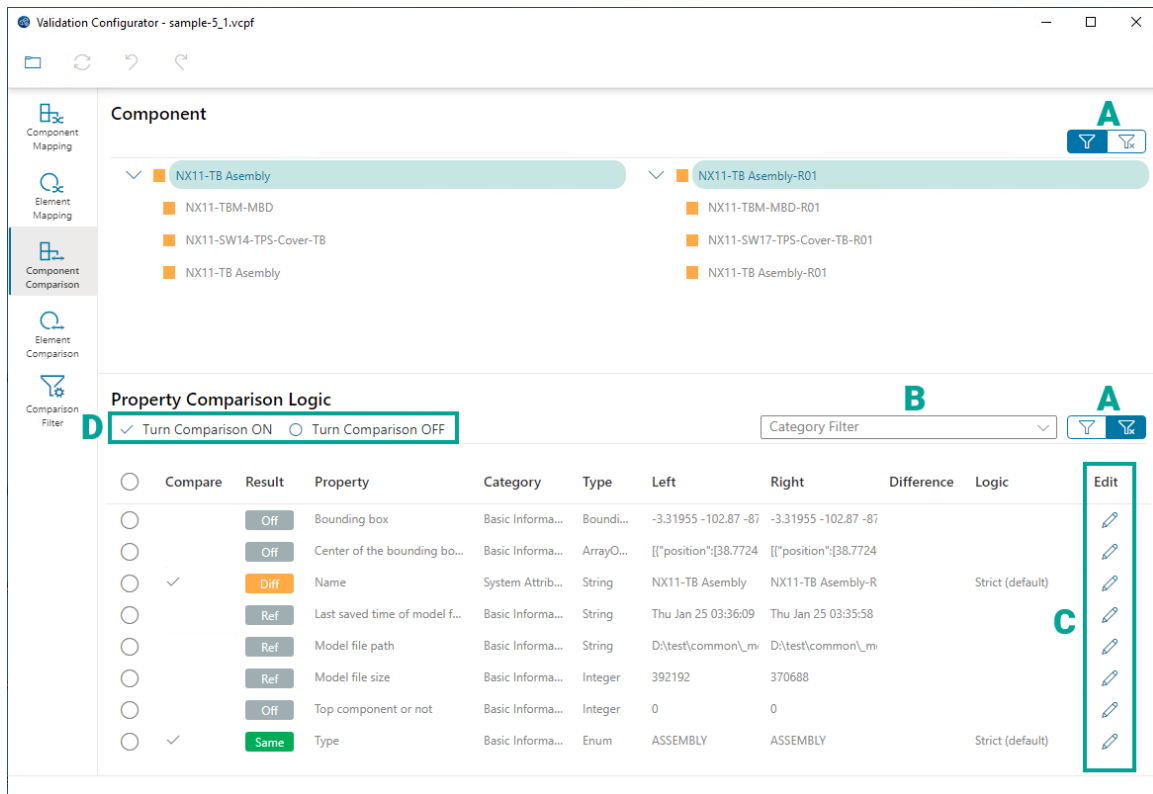
E: Total Score

Display the total score for individual property.

F: Edit

Start [Mapping Logic Edit Dialog](#) for individual property.

4.1.4. Component Comparison



A: Comparison Result Filter

- Show Only Diffs
Show only the Components and Elements with differences.
- Show All
Show all Components and Elements.

B: Category Filter

Filter the properties shown in the table by the selected categories.

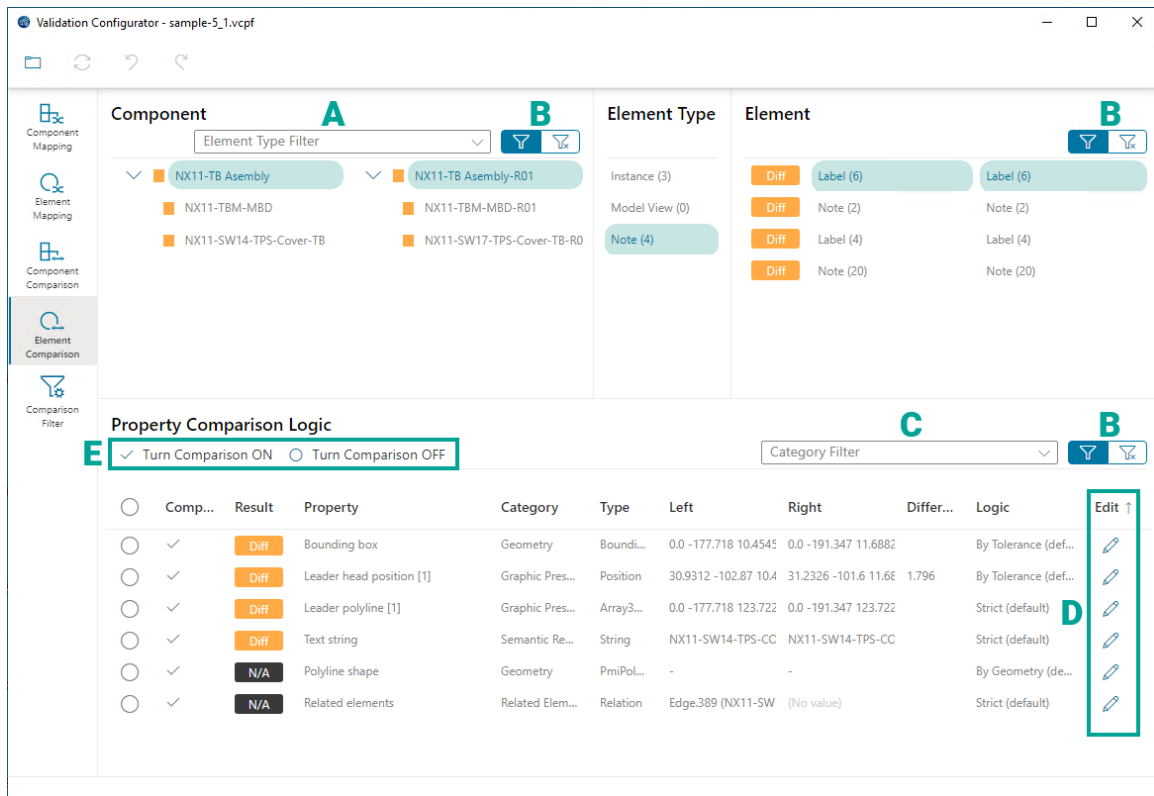
C: Edit

Start [Comparison Logic Edit Dialog](#) for individual property.

D: Turn Comparison ON/OFF

Include selected properties to compare together or exclude them from being compared.

4.1.5. Element Comparison



A: Element Type Filter

Filter the Element Types shown in the preview.

B: Comparison Result Filter

- Show Only Diffs
Show only the Components and Elements with differences.
- Show All
Show all Components and Elements.

C: Category Filter

Filter the properties shown in the table by the selected categories.

D: Edit

Start [Comparison Logic Edit Dialog](#) for individual property.

E: Turn Comparison ON/OFF

Include selected properties to compare together or exclude them from being compared.

4.1.6. Comparison Filter

Validation Configurator - *sample-5_1.vcpf

Attribute **PMI**

A Summary of Element Comparison Result ⓘ

Element Type	Compare	Same	Diff	Rem	Add
Note	<input type="checkbox"/>	43	4	0	0
Datum	<input checked="" type="checkbox"/>	9	0	0	0
Datum Target	<input checked="" type="checkbox"/>	0	0	0	0
GD&T	<input checked="" type="checkbox"/>	11	0	0	0
Surface Finish	<input checked="" type="checkbox"/>	0	0	0	0
Dimension	<input checked="" type="checkbox"/>	66	2	0	0
Line Weld	<input checked="" type="checkbox"/>	0	0	0	0
Spot Weld	<input checked="" type="checkbox"/>	0	0	0	0
Locator	<input checked="" type="checkbox"/>	0	0	0	0
Symbol	<input checked="" type="checkbox"/>	11	0	0	0
Mock PMI	<input type="checkbox"/>	0	0	0	0
Other PMI	<input checked="" type="checkbox"/>	1	0	0	0
Model View	<input checked="" type="checkbox"/>	13	0	0	0

B Summary of Property Comparison Result ⓘ

Category ↑	Compare	Same	Diff	N/A
General Attribute	<input checked="" type="checkbox"/>	188	0	0
Geometry	<input checked="" type="checkbox"/>	43	4	47
Graphic Presentation	<input checked="" type="checkbox"/>	743	5	0
Related Element	<input checked="" type="checkbox"/>	0	0	6
Semantic Representation	<input checked="" type="checkbox"/>	44	3	0

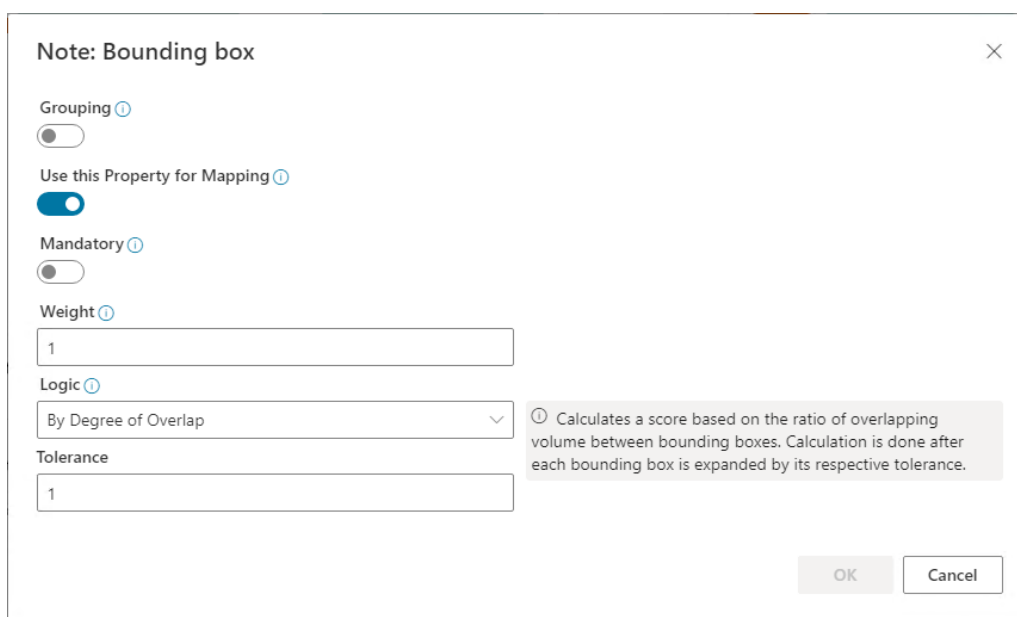
A: Compare (Summary of Element Comparison Result)

Toggle whether to compare or not for each Element Type.

B: Compare (Summary of Property Comparison Result)

Toggle whether to compare or not for each Property Category.

4.2. Mapping Logic Edit Dialog



The screenshot shows the 'Mapping Logic Edit Dialog' window. It has a title bar 'Note: Bounding box' and a close button 'X'. Inside, there are several settings:

- Grouping**: A toggle switch that is currently off.
- Use this Property for Mapping**: A toggle switch that is currently on.
- Mandatory**: A toggle switch that is currently off.
- Weight**: A text input field containing the value '1'.
- Logic**: A dropdown menu with 'By Degree of Overlap' selected.
- Tolerance**: A text input field containing the value '1'.

On the right side of the dialog, there is a grey box with a circular icon containing an 'i' and the following text: 'Calculates a score based on the ratio of overlapping volume between bounding boxes. Calculation is done after each bounding box is expanded by its respective tolerance.'

At the bottom right, there are two buttons: 'OK' and 'Cancel'.

Grouping

Calculating the score for all combinations for all Elements would take a processing time proportional to the square of the number of Elements. To decrease the number of combinations for score calculation and shorten the processing time, set "Grouping" option. If there is a property with "Grouping" enabled, you can reduce the processing time because the score is only calculated between Elements whose values are close to each other.

When multiple properties are grouped, the score will be calculated if the values of any of the properties are close.

Use this Property for Mapping

Enable this option for a property used for score calculation.

Mandatory

If the score of a property becomes "0" where Mandatory flag is set, the pair will not be mapped even if the other property has a higher score. Enable this function for a property that must match.

Weight

Set a larger number for properties that should have greater effects on Total Score. On the contrary, to reduce the effect, set a smaller number such as "0.1".

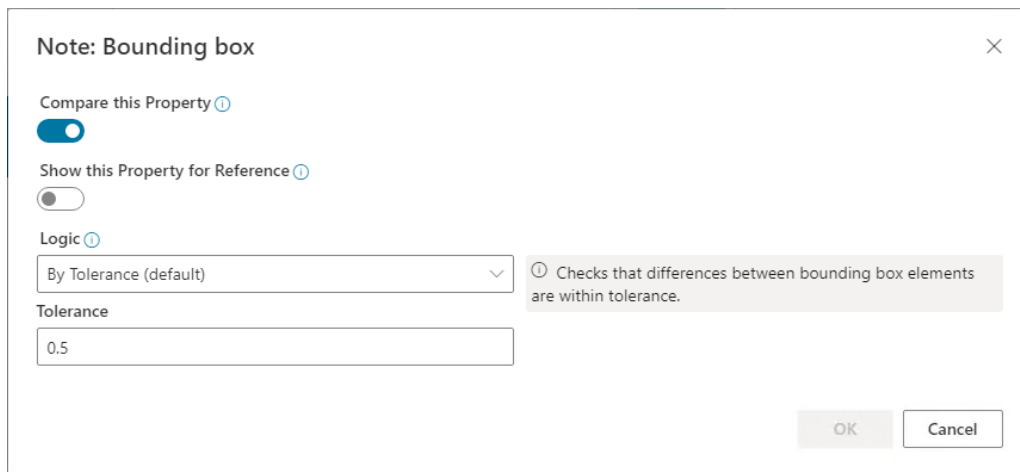
Logic

Select a logic that is to be used for score calculation.

Tolerance

Some score calculation logics allow you to enter parameters such as "Tolerance"; however, the meaning of the parameters will change depending on the logic. Therefore, please refer to the description of each logic for details.

4.3. Comparison Logic Edit Dialog



The dialog box is titled "Note: Bounding box" with a close button (X) in the top right corner. It contains the following controls:

- Compare this Property**: A toggle switch that is currently turned on.
- Show this Property for Reference**: A toggle switch that is currently turned off.
- Logic**: A dropdown menu showing "By Tolerance (default)".
- Tolerance**: A text input field containing the value "0.5".
- Help Text**: A grey box with a question mark icon containing the text: "Checks that differences between bounding box elements are within tolerance."
- Buttons**: "OK" and "Cancel" buttons at the bottom right.

Compare this Property

Enable this option for a property that is to be compared.

Show this Property for Reference

Enable this option for a property which should be displayed on a report, but not compared.

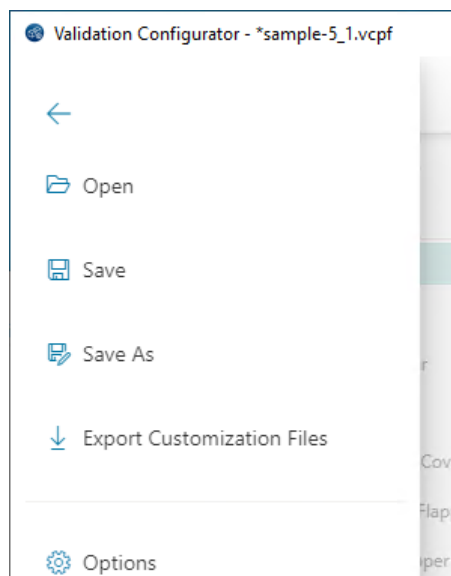
Logic

Select a logic that is to be used to compare.

Tolerance

Some comparison logics allow you to enter parameters such as "Tolerance"; however, the meaning of the parameters will change depending on the logic. Therefore, please refer to the description of each logic for details.

4.4. File Menu



Open

Open Validation Configurator Project File.

Save

Save Validation Configurator Project File.

Save As

Change the name of Validation Configurator Project File and save.

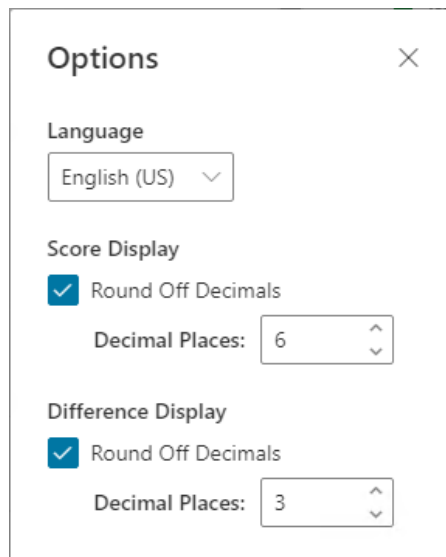
Export Customization Files

Export the Customization File. Multiple files will be created in the specified folder.

Options

Start "Options" dialog.

4.5. Options Dialog



The screenshot shows the 'Options' dialog box. It has a title bar with the text 'Options' and a close button (X). The dialog is divided into three sections: 'Language', 'Score Display', and 'Difference Display'. The 'Language' section has a dropdown menu currently showing 'English (US)'. The 'Score Display' section has a checked checkbox labeled 'Round Off Decimals' and a 'Decimal Places' spinner set to 6. The 'Difference Display' section has a checked checkbox labeled 'Round Off Decimals' and a 'Decimal Places' spinner set to 3.

Language

Switch the language to use in Validation Configurator.

Score Display

Round off and display the numbers in "Score" column and "Total Score" of Property Mapping Logic table to the specified digits.

Difference Display

Round off and display the numbers in "Difference" column of Property Comparison Logic table to the specified digits.

5. Examples

The following tutorials will guide you through some of the common customization methods and the necessary sample models to be used with them. If you are using Validation Configurator for the first time, it is recommended that you go through the tutorials. Estimated working time for each tutorial is 5 to 10 minutes.

5.1. Disable Unnecessary Comparison

Use Case

While looking at the comparison result, from the properties with differences, select the ones that do not need to have differences detected, then turn "Compare" OFF.

Steps

1. Open the following Validation Configurator Project File.
 - sample-5_1.vcpf
2. Open [Element Comparison] in the navigation window. In [Component] pane, select "NX11-TBM-MBD-R01". In [Element Type] pane, select "Dimension". In [Element] pane, select "Linear Dimension (48)".
3. Numerous differences are displayed in [Property Comparison Logic] pane. Disable the ones that do not require comparisons to be performed. Select the following properties:
 - Layer number
 - Projection line polyline (1)
 - Projection line polyline (2)
4. In [Property Comparison Logic], select [Turn Comparison OFF] in the toolbar.

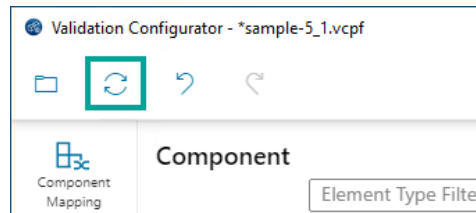
Property Comparison Logic					
<input checked="" type="radio"/> Turn Comparison ON <input type="radio"/> Turn Comparison OFF					
Comp...	Result	Property	Category	Type	
<input type="radio"/>	✓	Diff	Bounding box	Geometry	BoundingBox
<input checked="" type="radio"/>	✓	Diff	Layer number	General Attribute	Integer
<input type="radio"/>	✓	Diff	Dimension value	Semantic Representation	Double
<input type="radio"/>	✓	Diff	Dimension value (string)	Semantic Representation	String
<input type="radio"/>	✓	Diff	Name	General Attribute	String
<input type="radio"/>	✓	N/A	Polyline shape	Geometry	PmiPolyline
<input type="radio"/>	✓	Diff	Position	Graphic Presentation	Position
<input type="radio"/>	✓	N/A	Related elements	Related Element	Relation
<input type="radio"/>	✓	Diff	Projection line head positions	Graphic Presentation	Array3DCoords
<input checked="" type="radio"/>	✓	Diff	Projection line polyline (1)	Graphic Presentation	Array3DCoords
<input checked="" type="radio"/>	✓	Diff	Projection line polyline (2)	Graphic Presentation	Array3DCoords

5. Confirm that the checkmarks are removed from "Comparison" column. The specified three types of comparisons have been disabled as a result of operation.

Property Comparison Logic					
<input checked="" type="checkbox"/> Turn Comparison ON <input type="checkbox"/> Turn Comparison OFF					
<input type="checkbox"/>	Compare	Result	Property	Category	Type
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Diff	Bounding box	Geometry	BoundingBox
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Diff	Layer number	General Attribute	Integer
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Diff	Dimension value	Semantic Representation	Double
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Diff	Dimension value (string)	Semantic Representation	String
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Diff	Name	General Attribute	String
<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A	Polyline shape	Geometry	PmiPolyline
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Diff	Position	Graphic Presentation	Position
<input type="checkbox"/>	<input checked="" type="checkbox"/>	N/A	Related elements	Related Element	Relation
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Diff	Projection line head positions	Graphic Presentation	Array3DCoords
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Diff	Projection line polyline (1)	Graphic Presentation	Array3DCoords
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Diff	Projection line polyline (2)	Graphic Presentation	Array3DCoords

- When selecting the other dimension element "Linear Dimension (43)", you will see that the comparison is also disabled.

6. [Update Preview] (↺) is active. Click and wait for a while.



7. After updating the preview, select the Component, Element Type, and Element again. When looking at [Property Comparison Logic] pane, you can see that the property for which you disabled the comparison is no longer "Diff".

- When "Show All" at the far right of the toolbar is pressed, properties other than those determined to be different are also displayed.



- Properties that have "Compare" disabled have changed to "Off". Off" indicates that no comparison was made.

<input type="checkbox"/>	<input checked="" type="checkbox"/>	Same	Frame
<input type="checkbox"/>	<input type="checkbox"/>	Off	Layer number
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Same	Line thickness

- When selecting the other dimension elements, you will see that these properties are no longer "Diff" as well.



If the preview is updated after making a configuration change, the display sample you are using will be updated, but this is to see how the logic changes affect the comparison results. The comparison results information in the sample is not updated. To obtain a result that does not compare the three properties of the dimension type, output a Customization File, then run the CAD validation again using that Customization File.

5.2. Change Comparison Logic and Tolerance Used for Comparison

Use Case

By looking at the comparison result of "Center of gravity" for the parts, tune the comparison logic and tolerance so that a slight shift in "Center of gravity" is not detected.

Steps

1. Open the following Validation Configurator Project File.
 - sample-5_1.vcpf
2. Open [Component Comparison] in the navigation window. In [Component] pane, select the part "NX11-TBM-MBD-R01".
3. In [Property Comparison Logic] pane, check the difference of "Center of gravity". This is off by 0.282mm. Considering that this difference is overdetected, try customizing so that it is not detected as a difference.

Property Comparison Logic

☒ Turn Comparison ON
 ☐ Turn Comparison OFF
 Category Filter

<input type="radio"/>	Comp...	Result	Property	Category	Type	Left	Right	Difference	Logic	Edit
<input type="radio"/>	<input checked="" type="checkbox"/>	Diff	Center of gravity	Physical Property	Position	-14.34372 -12.22578	-14.14867 -12.30751	0.282	By Relative Tolerance...	<input type="button" value="Edit"/>
<input type="radio"/>	<input checked="" type="checkbox"/>	Diff	Name	System Attribute	String	NX11-TBM-MBD	NX11-TBM-MBD-R01		Strict (default)	<input type="button" value="Edit"/>
<input type="radio"/>	<input checked="" type="checkbox"/>	Diff	Surface area	Physical Property	Double	96660.66444	96461.87752		By Tolerance Ratio	<input type="button" value="Edit"/>
<input type="radio"/>	<input checked="" type="checkbox"/>	Diff	Volume	Physical Property	Double	221824.78502	220956.72449		By Tolerance Ratio	<input type="button" value="Edit"/>

4. Start "Comparison Logic Edit" dialog.

System Attribute: Center of gravity

Compare this Property ☒

Show this Property for Reference ☐

Logic

By Relative Tolerance for Gravity Point

Tolerance

0.001

Checks that the ratio of deviation between center of gravities to the length of the bounding box of the whole part is within tolerance.

5. Logic "By Relative Tolerance for Gravity Point" is selected and Tolerance "0.001" is set. Change the logic to "By Tolerance" and Tolerance to "0.5".

- When "By Relative Tolerance for Gravity Point" is selected, the threshold is calculated based on the size of the entire part. Tolerance, at this time, is relative tolerance. Relative tolerance of 0.001 means that if the diagonal length of the bounding box part is, for example, 100 mm, then the threshold 0.1 mm will be judged as a match.
 - When "By Tolerance" is selected, "Tolerance" will become absolute tolerance. A slightly larger value "0.5mm" is specified so the difference of "Center of gravity" of 0.282mm will be judged as a match.
6. Click [OK] to close "Comparison Logic Edit" dialog.
7. [Update Preview] (↻) is active. Click and wait for a while.
8. After updating the preview, select the previous Component again. Confirm that "Center of gravity" is no longer "Diff".
- Change the comparison result filter to "Show All" and confirm that "Center of gravity" has changed to "Same".

<input type="radio"/>	✓	Same	Geometry type
<input type="radio"/>	✓	Same	Center of gravity
<input type="radio"/>	✓	Diff	Name

5.3. Change Mapping Logic to Correct Comparison Element Pair

As explained in 3.1, "Process of CAD Validator", the relation of Components and Elements are determined by calculating score through the following steps and setting the relation in the descending order for Total Score. Since there are multiple settings to edit, each one will be explained by using examples.

1. If Grouping is set, only pairs with similar property values are candidates for mapping. If not set, the score calculation will calculate all combinations between the specified Elements.

- For Element pairs that are candidates for mapping, every property has its score calculated. However, if Mandatory property score is "0", that Element pair is excluded from the mapping candidates.
- Total Score is the sum of all scores, and each score is calculated by multiplying the weight defined for each property by the pure score. Finalize mapping according to the descending order of the scores.

5.3.1. Change Property and Weight of Score Calculation Target

Use Case

Increasing and decreasing number of parts exist in 1st and 2nd models, and the names have been changed. In default Customization File, they are more likely to pair up if the part names match, but in this case, try to customize the mapping so the ones closer in position are mapped. Specifically, change the mapping of parts as follows.

1. Mapping before tuning

1st model	2nd model
NX11-TB-Screw1---A001	NX11-TB-Screw1---B001
NX11-TB-Screw1	NX11-TB-Screw1
NX11-TB-Screw1---A002	NX11-TB-Screw1---B002

2. Mapping after tuning

1st model	2nd model
NX11-TB-Screw1---A001	NX11-TB-Screw1
NX11-TB-Screw1	NX11-TB-Screw1---B001
NX11-TB-Screw1---A002	NX11-TB-Screw1---B002

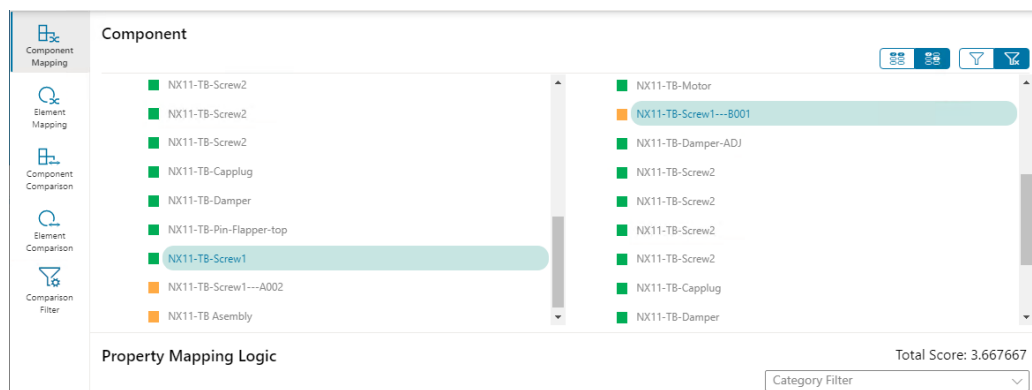
Steps

- Open the following Validation Configurator Project File.
 - sample-5_3_1.vcpf
- Open [Component Mapping] in the navigation window.
- Confirm the Total Score for each mapping in 1, "Mapping before tuning" and 2, "Mapping after tuning".

1st model	2nd model	Total Score	Note
NX11-TB-Screw1---A001	NX11-TB-Screw1---B001	2.953381	Unintended mapping

1st model	2nd model	Total Score	Note
NX11-TB-Screw1	NX11-TB-Screw1	4.001	Unintended mapping
NX11-TB-Screw1---A002	NX11-TB-Screw1---B002	3.953381	Intended mapping
NX11-TB-Screw1---A001	NX11-TB-Screw1	2.667667	Intended mapping
NX11-TB-Screw1	NX11-TB-Screw1---B001	3.667667	Intended mapping

- In this case, switch "Pair Selection Mode" to "Select Pair Manually" to see the scores between unmapped ones.



- Currently, this mapping situation is caused because Total Score of unintended mapping pair is higher; therefore, adjust "Weight", etc. so Total Score of the intended mapping pair becomes higher.
4. Check which properties score higher in the unintended mapping pairs and the intended mapping pairs, respectively.
 - Unintended mapping pair has a high score in "Name", and intended mapping pair has a high score in "Center of the bounding box in global coordinates".

Property	Category	Type	Left	Right	Groupi...	Manda...	Weight	Score ↓	Edit
Name	System Attribute	String	NX11-TB-Screw1	NX11-TB-Screw1	✓ (PASS)		2	2	
Number of faces	Number of Ele...	Integer	22	22			1	1	
Bounding box	Basic Information	Boundi...	-3.937 -3.937 -3.81 3	-3.937 -3.937 -3.81 3			1	1	
Parent instance names	Basic Information	ArraySt...	["NX11-TB-SCREW1"]	["NX11-TB-SCREW1"]			0.001	0.001	
Center of the bounding box in global coordinates	Basic Information	ArrayO...	[{"position": [41.6896	[{"position": [9.62684	✓ (FAIL)		1	0	
Parent component names	Basic Information	ArraySt...	["NX11-TB Assembly"]	["NX11-TB Assembly-			1	0	
Top component or not	Basic Information	Integer	18	28			2	0	

Fig. 1. Unintended mapping pair score

Property Mapping Logic

Total Score: 3.667667

Property	Category	Type	Left	Right	Groupi...	Manda...	Weight	Score ↓	Edit
Number of faces	Number of Ele...	Integer	22	22			1	1	
Center of the bounding box in global coordinates	Basic Information	ArrayO...	[{"position":41.6896	[{"position":41.6896	✓ (PASS)		1	1	
Bounding box	Basic Information	Boundi...	-3.937 -3.937 -3.81 3	-3.937 -3.937 -3.81 3			1	1	
Name	System Attribute	String	NX11-TB-Screw1	NX11-TB-Screw1---	✓ (PASS)		2	0.666667	
Parent instance names	Basic Information	ArraySt...	["NX11-TB-SCREW1"	["NX11-TB-SCREW1"			0.001	0.001	
Parent component names	Basic Information	ArraySt...	["NX11-TB Assembly"	["NX11-TB Assembly-			1	0	
Top component or not	Basic Information	Integer	18	37			2	0	

Fig. 2. Intended mapping pair score

5. Decrease "Weight" of "Name" from 2 to 1, and increase "Weight" of "Center of the bounding box in global coordinates" from 1 to 2.

- For each property, click [Edit] (✎) to open "Mapping Logic Edit" dialog. Change the value of "Weight".

System Attribute: Name

Grouping ☒

Use this Property for Mapping ☒

Mandatory ☐

Weight

Logic

Calculates a score based on string similarity. Case is ignored.

OK Cancel

- As a result of changing "Weight", Total Score will be:

1st model	2nd model	Total Score	Note
NX11-TB-Screw1---A001	NX11-TB-Screw1---B001	2.47719	Unintended mapping
NX11-TB-Screw1	NX11-TB-Screw1	3.001	Unintended mapping
NX11-TB-Screw1---A002	NX11-TB-Screw1---B002	4.47719	Intended mapping
NX11-TB-Screw1---A001	NX11-TB-Screw1	2.334333	Intended mapping

1st model	2nd model	Total Score	Note
NX11-TB-Screw1	NX11-TB-Screw1---B001	4.334333	Intended mapping

- Since they are mapped in the order of Total Score, tuning these weights alone should solve the problem; however, if "Name" is not trustworthy for the score calculation, it can be excluded from the score calculation in the first place. In such a case, disable "Use this Property for Mapping" in "Mapping Logic Edit" dialog.

6. Press [Update Preview] () to make sure that mapping is as expected.

5.3.2. Change Mandatory Setting of Property for Score Calculation

Use Case

Prevent datum with different label from being mapped. Specifically, change the datum mapping as follows:

3. Mapping before tuning

1st model	2nd model	Status
Datum Feature Symbol B (8)	Datum Feature Symbol C (9)	Diff

4. Mapping after tuning

1st model	2nd model	Status
Datum Feature Symbol B (8)	-	Rem
-	Datum Feature Symbol C (9)	Add



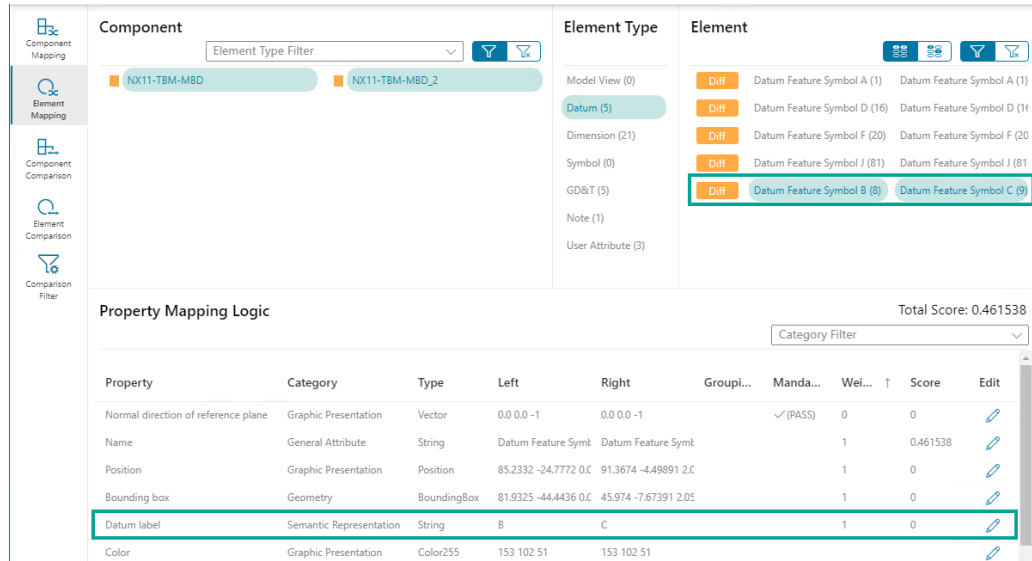
In this case, try to achieve the intended mapping by using the setting where the score calculation result is always greater than "0" for "Datum label" property. (This setting is called "Mandatory".)

Please refer to 4.2, "[Mapping Logic Edit Dialog](#)" for details about "Mandatory" setting.

Steps

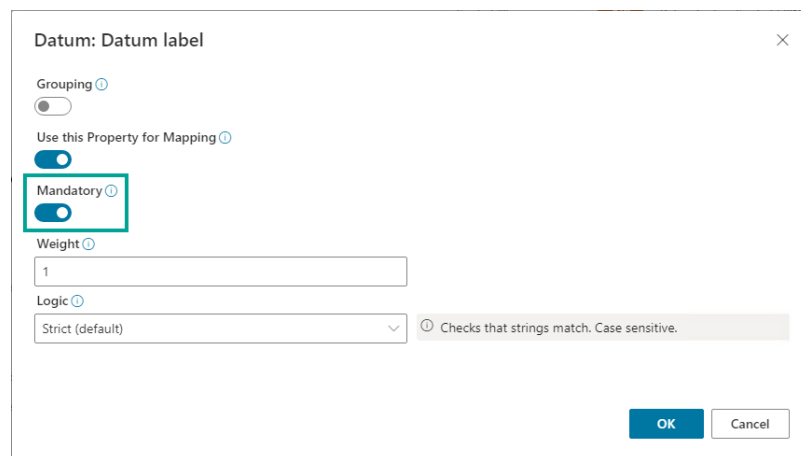
1. Open the following Validation Configurator Project File.
 - sample-5_3_2.vcpf
2. Open [Element Mapping] in the navigation window.
3. Confirm the mapping status of Datum.
 - In Element Type, select "Datum". In Element list, select "Datum Feature Symbol B (8)".
 - "Datum Feature Symbol B (8)" and "Datum Feature Symbol C (9)" are mapped and

compared even though the Datum labels do not match.



4. Set "Datum label" property to "Mandatory".

- Press [Edit] () to open "Mapping Logic Edit" dialog, and enable "Mandatory".



5. Press [Update Preview] () to make sure that mapping is as expected.

5.3.3. Change Score Calculation Logic

Use Case

Dimensions that are unrelated but have similar names are paired in the default Customization File. Customize them so that they are not paired. Specifically, change the dimension mapping as follows:

5. Mapping before tuning

1st model	2nd model	Status
Linear Dimension (19)	Linear Dimension (32)	Diff

6. Mapping after tuning


1st model	2nd model	Status
Linear Dimension (19)	-	Rem
-	Linear Dimension (32)	Add

Steps

- Open the following Validation Configurator Project File.
 - sample-5_3_3.vcpf
- Open [Element Mapping] in the navigation window.
- Confirm the mapping status of Dimension.
 - In Element Type, select "Dimension". In Element list, select "Linear Dimension (19)".
 - Obviously, "Linear Dimension (19)" and "Linear Dimension (32)" are mapped and compared just because they have similar names.

The screenshot shows the 'Element Mapping' window. On the left, the 'Component' section lists 'NX11-TBM-MBD' and 'NX11-TBM-MBD_2'. The 'Element Type' is set to 'Dimension (20)'. The 'Element' list shows various dimension types, with 'Linear Dimension (19)' and 'Linear Dimension (32)' both marked as 'Diff'. Below this, the 'Property Mapping Logic' table is displayed, showing properties like 'Normal direction of reference plane', 'Dimension type', 'Name', 'Position', 'Bounding box', 'Dimension value', and 'Color'. The 'Name' property is highlighted, showing a score of 0.452381.

Property	Category	Type	Left	Right	Grouping	Mandatory	Weight	Score	Edit
Normal direction of reference plane	Graphic Presentation	Vector	0.0 0.0 -1	0.0 0.0 -1		✓ (PASS)	0	0	
Dimension type	Semantic Representation	Enum	distance	distance		✓ (PASS)	0	0	
Name	General Attribute	String	Linear Dimension (1)	Linear Dimension (3)			1	0.452381	
Position	Graphic Presentation	Position	-18.7516 118.808 32	93.1102 18.2562 -5.6			1	0	
Bounding box	Geometry	BoundingBox	-30.4165 0.0 32.3394	38.1 0.0 -5.63993e-1			1	0	
Dimension value	Semantic Representation	Double	60.833	33.3375			1	0	
Color	Graphic Presentation	Color255	153 102 51	153 102 51					

- Customize these two dimensions so that they are not mapped just because they have similar names.
- Change the score calculation logic of "Name" property to "Strict (default)".
 - Press [Edit ()] and open "Mapping Logic Edit" dialog.
 - Change "By Similarity (for PMI names)" to "Strict (default)".

5. Press [Update Preview] (↺) to make sure that mapping is as expected.

- When Total Score is "0", it will not be mapped.



Please note that to prevent unintended mapping from being set, setting "Name" comparison logic to "Strict (default)" is not always the correct way. If it is clear operationally that different names are different elements, this is the correct way to modify; however, if not, then a different method should be considered.

5.3.4. Change Grouping Setting

Use Case

Although the original part is identical, the name has been changed and the instance placement matrix has been moved significantly. With default Customization Files, parts are grouped by name and location. But in this case, parts are not mapped as intended because they do not fall into the same group due to the effects of this behavior. Ungroup these two parts so that they are mapped. Specifically, change the mapping of the parts as follows:

7. Mapping before tuning

1st model	2nd model	Status
NX11-TBM-MBD	-	Rem
NX11-SW14-TPS-Cover-TB	-	Rem
-	Moved-NX11-TBM-MBD-R01	Add
-	Moved-NX11-SW17-TPS-Cover-TB-R01	Add

8. Mapping after tuning

1st model	2nd model	Status
NX11-TBM-MBD	Moved-NX11-TBM-MBD-R01	Diff
NX11-SW14-TPS-Cover-TB	Moved-NX11-SW17-TPS-Cover-TB-R01	Diff

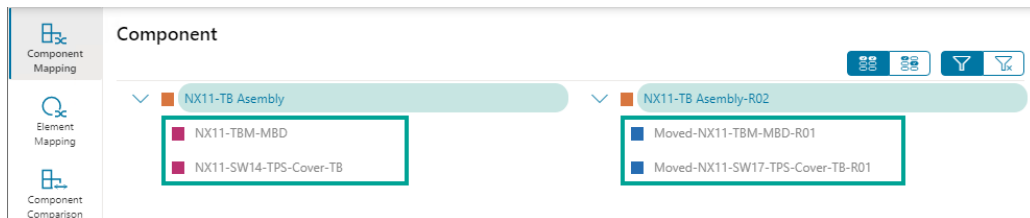


Please note that Grouping is performed for the purpose of reducing the number of score calculation processes when the number of Elements and Components are numerous. Ungrouping will increase the mapping accuracy, but it will also take more time to process.

Refer to [4.2, "Mapping Logic Edit Dialog"](#) for details about Grouping.

Steps

1. Open the following Validation Configurator Project File.
 - sample-5_3_4.vcpf
2. Open [Component Mapping] in the navigation window.
3. Confirm the mapping status of the Components.
 - In Component list, the target parts have "Add" and "Rem", which mean that they are not mapped.



Each color label in the Component list corresponds to a comparison result label in the Element list. Colors are: green = Same, orange = Diff, red = Rem, and blue = Add.

- When switching "Pair Selection Mode" to "Select Pair Manually", selecting the parts to pair up, and then looking at the Property Mapping Logic table, you can see that in "Grouping" column, both "Name" and "Center of the bounding box in global coordinates" are judged "FAIL". Also, confirm that Total Score is "N/A". From these situations, the reason the parts were not mapped is because they did not fall into the same group in "Grouping" and thus the score was not calculated.

Property	Category	Type	Left	Right	Grouping	Mandatory	Weight	Score ↓	Edit
Number of faces	Number of Elements	Integer	588	588			1	1	
Bounding box	Basic Information	BoundingBox	-69.85 -87.0889 0.0 5	-69.85 -87.0889 0.0 5			1	1	
Name	System Attribute	String	NX11-TBM-MBD	Moved-NX11-TBM-I	✓ (FAIL)		2	0.545455	
Center of the bounding box in global coordinates	Basic Information	ArrayObject	[["position": [39.88614	[["position": [39.8861	✓ (FAIL)		1	0	
Parent instance names	Basic Information	ArrayString	["NX11-TBM-MBD"]	["NX11-TBM-MBD-R			0.001	0	
Parent component names	Basic Information	ArrayString	["NX11-TB Assembly"]	["NX11-TB Assembly-			1	0	
Top component or not	Basic Information	Integer	1	28			2	0	
Model file path	Basic Information	String	D:\temp\NXFiles\NX1	D:\temp\NXFiles\NX					

4. Cancel "Grouping".

- For the two properties with "Grouping" enabled, press [Edit] () to open "Mapping Logic Edit" dialog and then disable "Grouping".

System Attribute: Name

☒ Grouping

☒ Use this Property for Mapping

☐ Mandatory

Weight: 2

Logic: By Similarity

Calculates a score based on string similarity. Case is ignored.

OK Cancel

- Press [Update Preview] () to make sure that mapping is as expected.

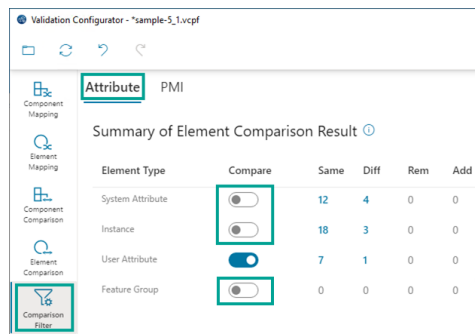
5.4. Specify Element Type and Switch "Compare" at Once

Use Case

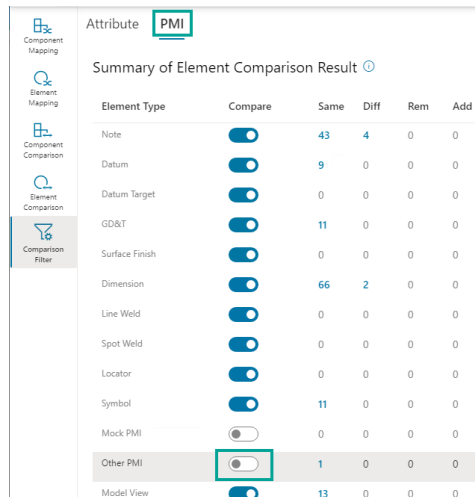
To ensure that the comparison result is displayed for others besides the major PMI types and user attributes, turn "Compare" OFF for "System Attribute", "Instance", "Feature Group", and "Other PMI".

Steps

- Open the following Validation Configurator Project File.
 - sample-5_1.vcpf
- Move to [Comparison Filter] in the navigation window.
- In [Attribute] tab, disable "Compare" for "System Attribute", "Instance", and "Feature Group".



4. In [PMI] tab, disable "Compare" for "Other PMI".



5. Press [Update Preview] (↻) to confirm that these Element Types are no longer compared.

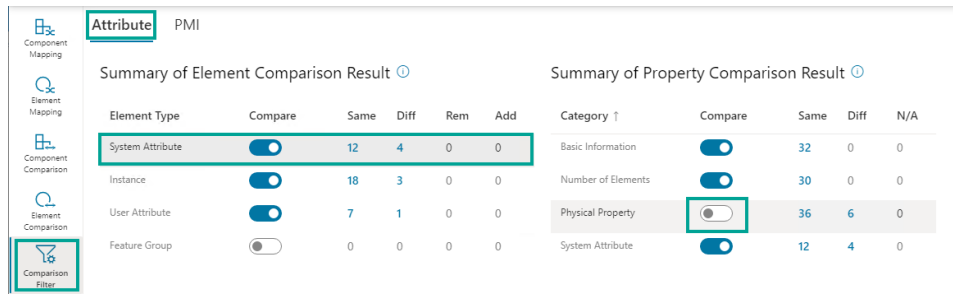
5.5. Specify Property Category and Switch "Compare" at Once

Use Case

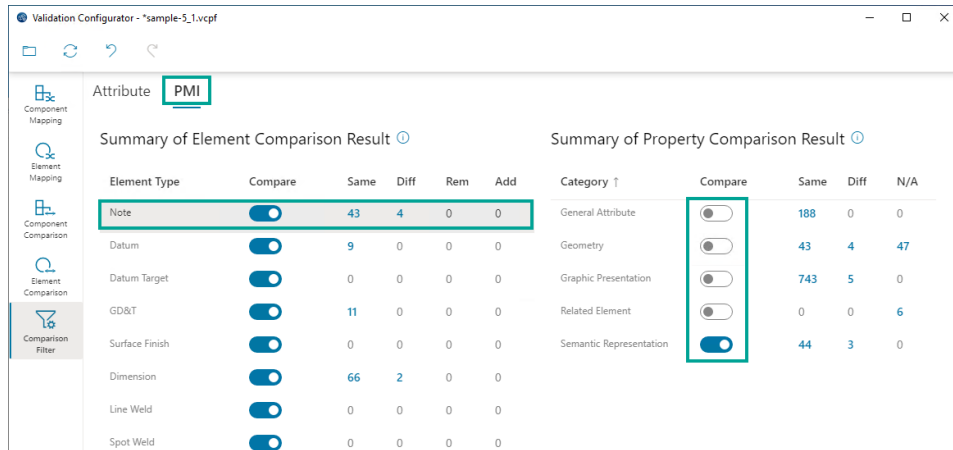
For "System Attribute", try not to compare "Physical Property". For [PMI] tab, try to compare only "Semantic Representation".

Steps

1. Open the following Validation Configurator Project File.
 - sample-5_1.vcpf
2. Move to [Comparison Filter] in the navigation window.
3. In [Attribute] tab, select "System Attribute". On the right, in "Summary of Property Comparison Result", disable "Compare" for "Physical Property".



4. In [PMI] tab, select each PMI type one by one and disable "Compare" for all Categories except "Semantic Representation" in "Summary of Property Comparison Result".



5. Press [Update Preview] (↻) to confirm that these properties in Category are no longer compared.

6. FAQ

6.1. What Validation Configurator Can and Cannot Do

The following is what you can or cannot do with Validation Configurator.

6.1.1. About Customization

- Can
 - Customize Mapping Logic
 - Change score calculation logic and adjust Tolerance
 - Adjust score Weight
 - Specify Mandatory property
 - Specify property Grouping
 - Customize Comparison Logic
 - Change Comparison Logic and adjust Tolerance
 - Turn Comparison ON / OFF
 - Toggle whether to compare / not compare by Element Type
 - Toggle whether to compare / not compare by property
 - Toggle whether to compare / not compare properties by Category
- Cannot
 - Customize logic of assembly configuration comparison
 - Customize logic of B-rep Attribute comparison
 - Customize logic for Grouping
 - Change settings related to Geometry comparison
 - Regarding Geometry comparison, decide whether to compare or not, or change Tolerance, etc. with parameters. However, Validation Configurator does not support such configuration changes. Therefore, please ensure to specify such changes in the parameter settings of the Scenario.
 - Add your own logic
 - Add your own property
 - Define pre-process or post-process
 - It can be defined in "customize_utility.rb", but cannot be edited in Validation Configurator. Edit "customize_utility.rb" output by Validation Configurator directly.

- If the Validation Configurator Project File is recreated using the Customization File, the definition will remain even if Validation Configurator edits it.

6.1.2. About Viewing

- Can
 - View comparison result equivalent to Validation Report
 - However, not on "3D View" window. In addition, comparison results that do not support previews such as Geometry comparison and B-rep Attribute comparison cannot be viewed.
 - Display the score calculated during the mapping process
 - Also, the score for unmapped Element or Component pairs can be seen.
 - Preview update based on the settings being edited
 - Because the information is not reobtained from ENF file, updating it is faster than running CAD Validator again.
- Cannot
 - Display on "3D View" window
 - View Geometry comparison or B-rep Attribute comparison result
 - Confirm the comparison results for some properties
 - "N/A" is displayed for anything that cannot be confirmed.

6.2. Troubleshooting

6.2.1. Multiple Instances for Validation Configurator not Starting

- Validation Configurator does NOT permit multiple instances.

6.2.2. Validation Configurator not Starting

- Because Validation Configurator does not permit multiple instances, if Validation Configurator is left as an invalid process due to some problems, you cannot start a new Validation Configurator. In such a case, start Task Manager and abort "ValidationConfigurator.exe". If multiple processes remain, abort them all.

6.2.3. "Same/Diff" in Element List Differs from Validation Report of CAD Validator

- There are properties that appear as "Same/Diff" in CAD Validator Validation Report, but appear as "N/A" in the Validation Configurator preview. This may occur specifically with "Polyline shape" and "Related Element" of PMI. This is the case when logic that cannot be processed is selected when previewing Validation Configurator.
- Property whose comparison result shows "N/A" is determined the "Same" when determining "Same/Diff" for the Element. For this reason, PMIs that differ only in "Polyline shape" and "Related Element" are displayed as "Same" in the preview display of Validation Configurator even in "Diff" in the Validation Report.

6.2.4. "Same/Diff" in Component List Differs from CAD Validator Result (Validation Report)

- There are cases where "Same/Diff" for the Component as a whole differs from the Validation Report due to unsupported comparison results in the Validation Configurator preview display.
- Specifically, a Component that differs only in Geometry comparison and B-rep Attribute comparison will show "Diff" in the Validation Report, but "Same" in Validation Configurator.

7. Appendix: Glossary

CAD Validator

One of the 3DxSUITE Components. CAD Validator is used to compare two models.

Category

Category breaks down properties into different types. It is not a hierarchy of properties. Not all properties are assigned to a Category.

Category is a useful attribute to manage properties together. When the project file is saved and reopened, the category-wise comparison ON/OFF status is translated into individual property comparison ON/OFF.

Customization

"Customization" in this manual means to edit the Customization File.

Customization File

This is a configuration file that can be entered as an option when running CAD Validator. The comparison logic, mapping logic, etc. can be freely customized. This is the file which is edited by Validation Configurator, then output as the final file.

Element Type

Element Type can be broken down into Elements. It is not possible to map across Element Types.

Hierarchical relation from top down is: Component > Element Type > Element > Property.

ENF

This is the input file for CAD Validator. CAD model is translated to an ENF file, then imported to CAD Validator to perform comparison.

1st model, 2nd model

To run CAD Validator, two models are imported. The source model will be called "1st model", and the target model will be called "2nd model".

Mapping

When comparing two models, the first step is to set up the relation between each component. After setting up how the components are related, set up the relation for each element such as PMI. Elements that have relation are compared with each other. Setting up a relationship is called "mapping".

Validation Configurator Project File

This file is created by executing CAD Validator. Included inside are the Customization Files, parameter files, and comparison results from running CAD Validator. By opening this project file with Validation Configurator, you can edit the Customization File while watching the preview of the comparison results.

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