Steps (macro) to map variability constructs to system design and functional safety information

1) BVR : Mapping a Feature to Model Elements:

i. Create a Placement Fragment: in the **SysML editor**: a) *select the elements* that should be removed from the SysML model when a given feature is selected to create a placement fragment; in the **BVR Realization editor**: b) *right mouse click* in the right side of the canvas to activate the menu, c) *select* the option *Create Placement*;

ii. Create a Replacement Fragment: in the **SysML editor**, a) *select the elements* that should be removed from the SysML model when a given feature is selected to create a placement fragment; in the **BVR Realization editor**: b) *right mouse click* in the right side of the canvas to activate the menu, c) *select* the option *Create Placement*;

iii. Create a Fragment Substitution: in the **BVR Realization editor**, a) *select* the created Placement and Replacement elements, b) *right mouse click* in in left side of the BVR realization editor, and c) *select* the option Create Fragment Substitution;

iv. Select the feature to be mapped to a Fragment Substitution: in the **BVR Realization editor**, in the left side of the editor, b) *open the combo box* to see the available features that can be mapped to the created Fragment Substitution and c) *select the feature* to be associated with the given Fragment Substitution.

v. Generate bindings: a) select the created Fragment Substitution in the *left side* of BVR Realization editor, b) *right mouse click* and c) *select the option* Generate Bindings.

2) CRITVAR-ML

2.2) Tasks for Mapping Features to Model Elements:

i. Create a new ElementVariationPoint: ***a)*** *select* (double click) the ElementVariationPoint element on the palette; to create the new ElementVariationPoint;

ii. Enter the feature expression: ***a)*** *double mouse click* the featureExpr parameter in the window that just opened, and ***b)*** *enter the desired* feature expression, ***c)*** *select* OK, and ***d)*** *select* OK; and

iii. Set the desired SysML model elements that should be annotated with the created ElementVariationPoint:

a) vii. *Highlight* the newly created ElementVariationPoint on the canvas;
b) viii. *Move* to the properties view;
c) ix. *Select* the 'UML' tab;
d) x. Select '+';
e) xi. Select the desired model elements in the window that just opened:

f) xii. Select the '!' button;
g) xiii. *Select* 'OK'.

2.3) Tasks for Mapping Features to Functional Safety Annotations without PropertyVariationPoint UML::Comment

i. Select the desired SysML model element in the graphical editor of the targeting modeling language;

ii. Select the desired stereotype: ***a)*** *ii. move* to the 'Properties' view, ***b)*** *iii*. *select* the Profile tab, and ***c)*** *iv. select* the desired stereotype.

iii. Select the desired SysML element property;

iv. Edit the property with variability expressions: associate each possible value that a property can assume with the respective variability construct by surrounding the value with (**#BeginVP…#EndVP**) variability expressions.

2.4) Tasks for Mapping Features to Functional Safety Annotations with PropertyVariationPoint UML::Comment

i. Create a PropertyVariationPoint: *a)* ***i.*** *select* (double click) the PropertyVariationPoint element on the palette to create the new PropertyVariationPoint;

iii. Set the PropertyVariationPoint subproperty with the name of the desired SysML element subproperty: a) *ii. double click* the 'subproperty' parameter on Window 1; *b) iii. enter* the desired *subproperty* name e.g., 'failureOccurrence' or 'fptc', in the window that just opened; and *c) iv. select* 'OK'.

iv. Set the PropertyVariationPoint expression parameter: ***a)*** *v. double* click the 'expression' parameter; ***b)*** *vi. enter* the desired expression in the window that just opened; ***c)*** *vii. select* 'OK'; and ***d)*** viii. *select* 'OK';

v. Annotate the desired SysML model element with the created PropertyVariationPoint stereotype: *a) ix. select* the 'Comment Link' element on the palette; ***b)*** *x. click* on the *PropertyVariationPoint* comment created in step i; ***c)*** *xi. click* on the desired element on the canvas to set it as an *annotatedElement*.

3) pure::variants

3.1) Tasks for Mapping Features to Model Elements

i. Create a new pvSCL expression: *a)* Right click in the Mappings view; *b)* Select 'New Condition'; *c)* Enter the desired feature expression in the window that just opened; *d)* Select 'OK';

ii. **Annotate the desired model element (s) that will remain in the model with feature expression defined in the task:** a) select the SysML model element (s) that should be annotated with the created pvSCL expression; b)
Move to the pure::variants Mappings editor; c) viii. Right click in the condition created in step i; d) ix. Select Add [Element] to [Condition].

3.2) Tasks for Mapping Feature to Safety Annotations

i. **Create a new pvSCL expression: a)** i. Right click in the Mappings view (Figure 58 d)); ***b)*** Select 'New Calculation'; ***c) iii)*** Enter the desired feature expression in the window that just opened; ***d) iv.*** Select 'OK';

ii. Annotate the desired property(s) with the created calculation: ***a) v.*** Move to the tree view model editor; ***b) vi.*** Select the desired property (can be either within a stereotype or not); ***c) vii.*** Move to the Mappings editor***; d)*** viii. Right click on the calculation created in step ii; ***e) ix.*** Select 'Add [Selected Property] to [Calculation Label]'; ***f) x.*** Select the desired sub property on the window that just opened; ***g) xi.*** Select 'OK' on Window 2.