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STUDENT TRAINING GUIDE

Introduction to Variant Management

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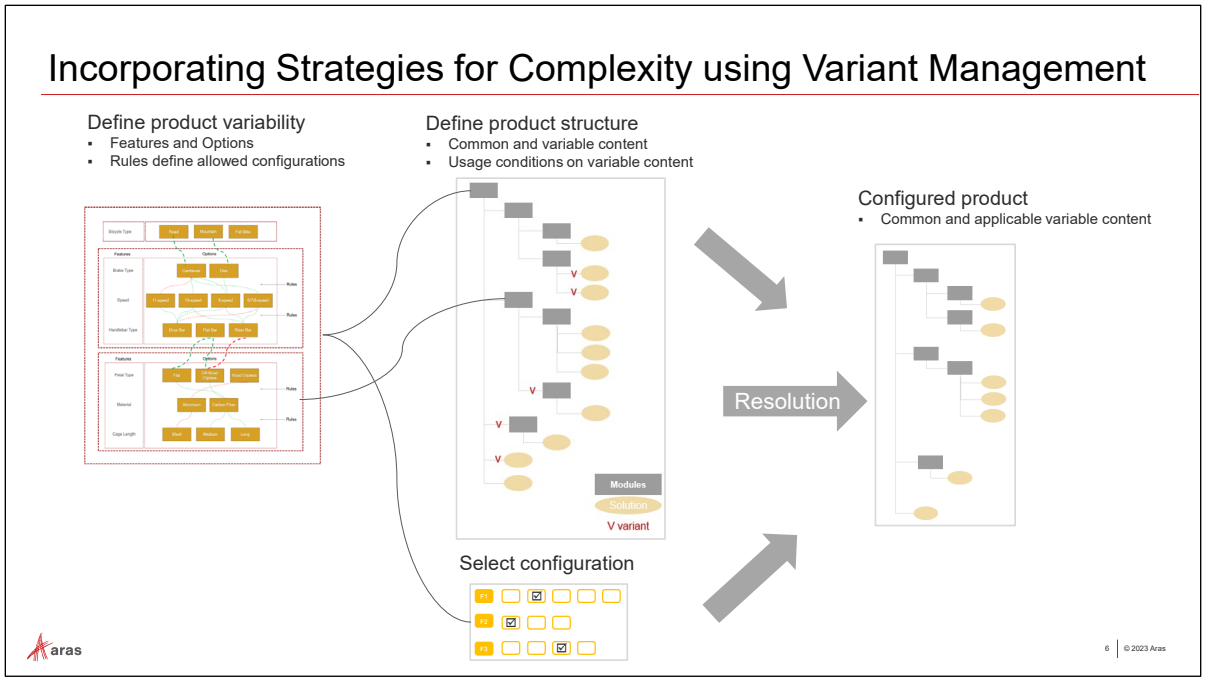
Overview

In this session you will familiarize with the Aras Innovator Variant Management application and its ability to define variable item configurations (e.g., 150% BOMs), resolve discreet configurations and eliminate duplication of variant in the database. Through hands-on exercises and lab activities, you will gain an understanding of Variant Management functionality and become familiar with the data model.

Goals

- Explore the Variant Management application through hands-on exercises.
- Familiarize with the Variant Management data model.
- Explore how variability is defined and used in the application.
- Resolve specific variants using the built-in Option selection functionality.

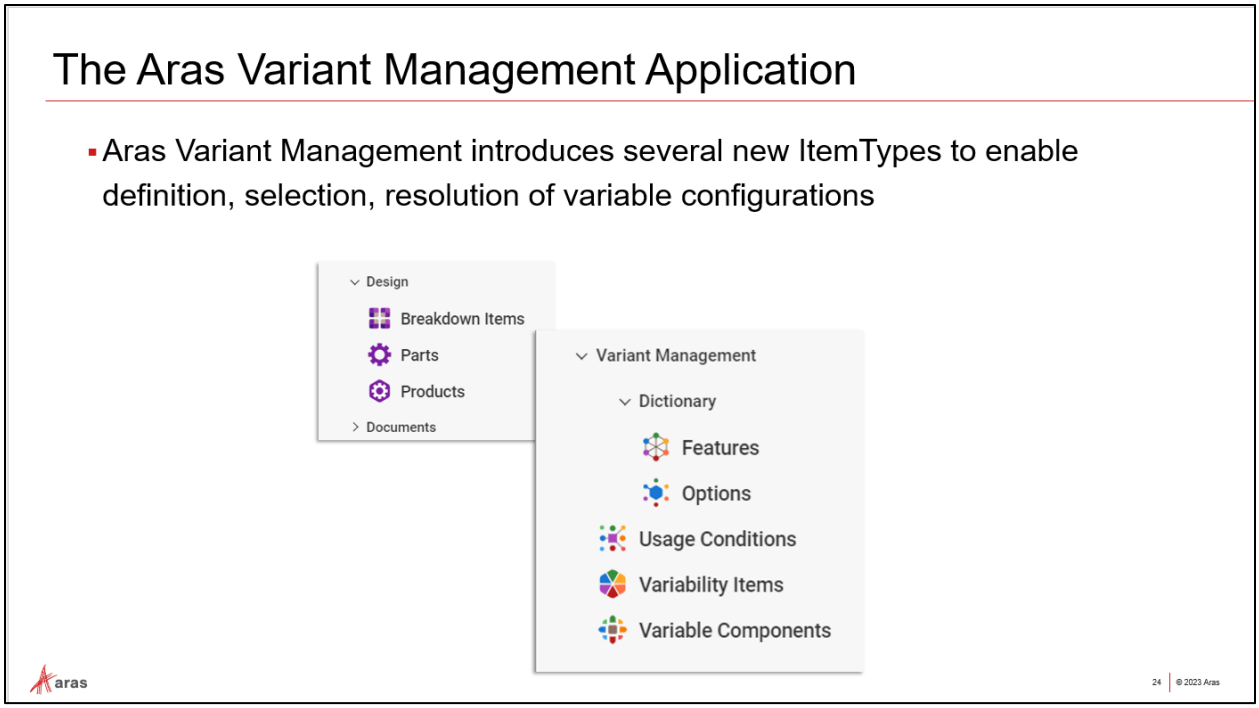
Using the provided variable configuration, students can explore and familiarize themselves with essential functionality offered by Variant Management. We will then proceed to extend the variability to support resolution of new variants.



Incorporating Strategies for Complexity using Variant Management

Managing variants of complex product platforms is essential to controlling costs and staying competitive in today's market. Aras Variant Management application helps you efficiently manage product variants on any abstraction level and with full traceability and change management. All variant definition information is maintained as part of the overall product digital thread managed by the Aras platform. This enables an efficient process of maximizing reuse, incorporating new product features, and performing change impact analysis.

Today's product complexities driven by pervasive connectivity, increasing software content, and a high degree of customization force OEMs to consider the basic tenets of variability management much earlier in the product lifecycle. These are cases where variability within a product platform is explored and established even before 3D CAD structures are designed or BOM structures with part numbers must be considered. Aras Variant Management provides services and applications to manage product platform variability and maximize reuse of common elements in any design representation, across all design stages as part of the PLM platform managed digital thread.



Aras Variant Management Application

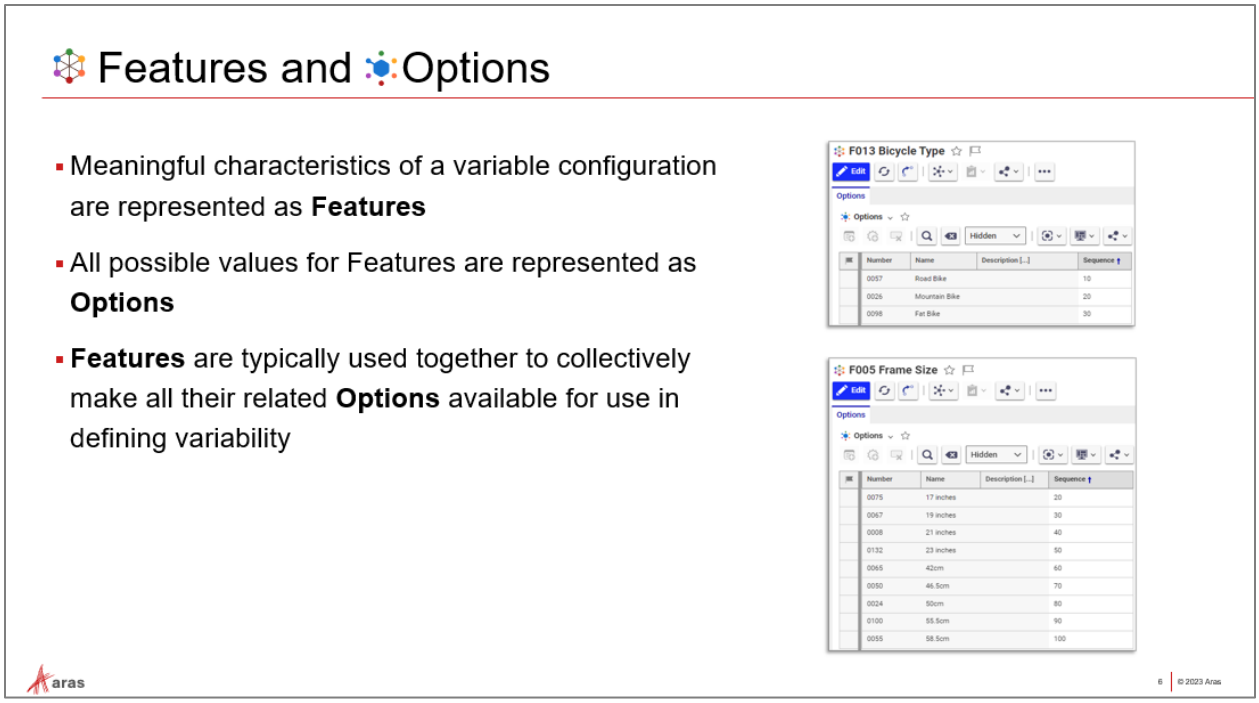
Variant Management provides a rich set of Itemtypes and user interfaces to allow users to define and configure the total variability of a product configuration into a single structure (i.e., '150% BOM'), eliminating the need to persist excessive numbers of variants as independent structures. Variants may number in the hundreds or even thousands, increasing cost and complexity of maintaining discreet product configurations.

An application layer over a Configurator engine resolves many discreet variants (i.e., '100% BOM') from a variable configuration based on Option selections. Graphical user interfaces simplify selection of options, definition of rules and conditions of usage throughout the application.

Access to Aras Variant Management application from the TOC is granted to members of the Variability Management group Identity.

Try It … Aras Variant Management in the TOC

1. Open the Navigation Panel to view the TOC.
2. Under Variant Management examine its categories which collectively define variability.
3. Expand the subcategory 'Dictionary' to view Features and Options.
4. Navigate to the Design TOC category, where you will also find Breakdown Items which represent the variable configurations often referred to as the 150% BOM structures.

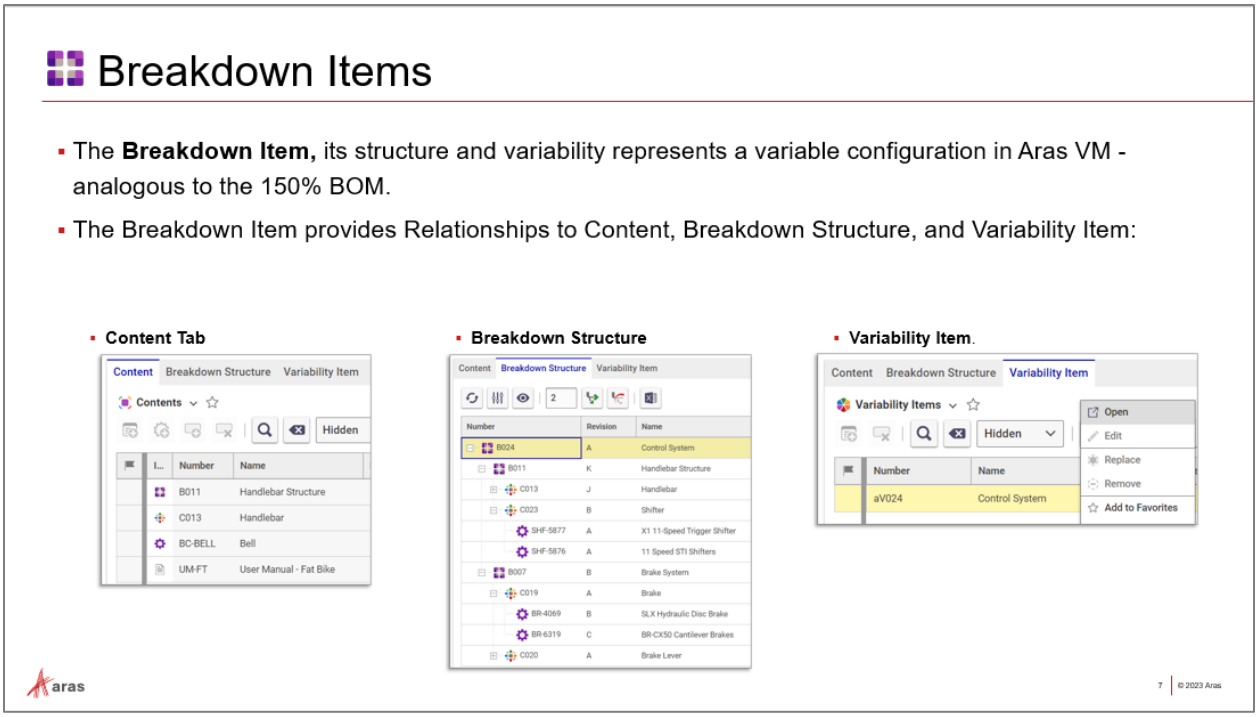


Features and Options

Variant Management provides Features and Options to represent the characteristics of a product (Features), and a range of values for each characteristic (Options). By specifying all valid options for each Feature, the scope of variability is defined. When specific options are selected for every Feature in a product, a variant is fully defined.

Try It … Find and View Features and Options

1. Under the Variant Management category in the TOC, expand the Dictionary category.
2. Search the Features category to locate the 'F013 Bicycle Type' Feature. Open this Feature for viewing.
3. Note that the Options Tab in the lower accordion is used to configure all allowable Options for this Feature.
4. Return to the Features search grid to locate and open '*F005 Frame Size*', note the large number of available Options for this particular Feature.
5. Close the Feature tabs.



Breakdown Items

The concept of the 150% BOM (or variable configuration) is represented by the **Breakdown Item**. All possible components that may be resolved into a specific variant are represented together in the Breakdown Structure. Breakdown Items have three Relationship Tabs:

Content tab

Components applicable to a Breakdown Item, i.e., the 'scope' of a variable configuration. This includes Variable Components, other Breakdown Items (as a structure), Parts, and Documents.

Breakdown Structure tab

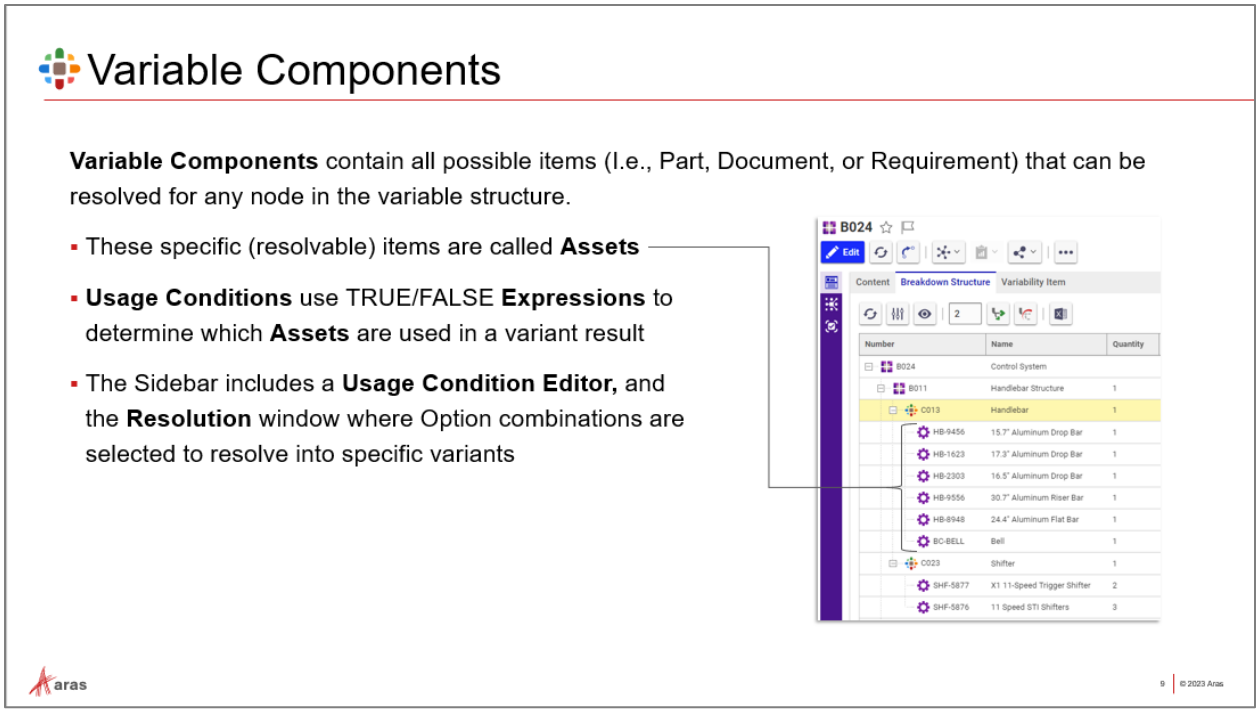
A Tree Grid View of the entire variable configuration (a.k.a. the 150% BOM).

Variability Item tab

Variability Items contain Rules and relevant Features used to constrain Option Selection during the Resolution of a variant.

Try It … View Breakdown Items

1. Expand the Design category in the TOC to search Breakdown Items.
2. Find and open **B012 Bicycle** for viewing. This is the top-level node in the Bicycle variable configuration.
3. View each of the three relationship tabs described above: Content, Breakdown Structure and Variability Item.
4. Click the **Breakdown Structure** tab to view the entire *variable configuration* of the bicycle in its hierarchy. This is analogous to the 150% BOM concept.
5. Remain in the Breakdown Structure view for the next exercise.



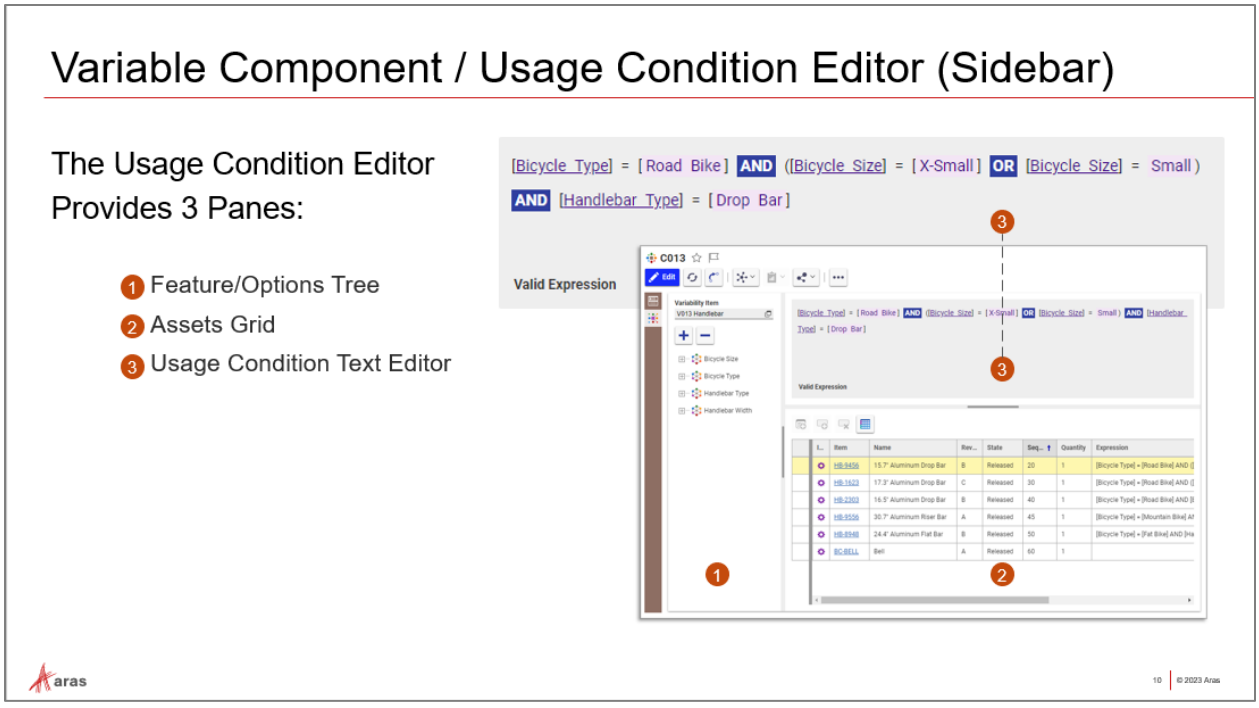
Variable Components

Within the Breakdown Item Structure, each generic component can be resolved to one of many specific items, called **Assets**. The Variable Component Itemtype can contain 1:N Assets, each of which may be a Part, Document, or CAD Document (assets are defined as Polyitems).

When a variant is resolved, the Options selected by a user are evaluated to determine which specific Asset is to be used. The expression used to make this determination is a **Usage Condition**. Usage Conditions are TRUE/FALSE (boolean) expressions that determine which from a number of Assets will be resolved to a specific Asset. Once all options selected resolve Variable Components to discreet Assets, we can say that it is a single variant. We will explore this fully later.

Try It … View Variable Components

1. While viewing the **B012 Bicycle** Breakdown Structure tab, search for and open Breakdown Item **B011 Handlebar Structure.** It is found in the third row, just below B024 Control System.
2. B011 Handlebar Structure contains the Variable Component **C013 Handlebar**. Open it for viewing using the RMB menu.
3. The **Assets** relationship tab shows all eligible **Parts** for the handlebar, depending on the expression in the right-most column, called the **Usage Condition**.
4. The **Variability Item** tab contains related Variability Item instances, from which Rules and Feature scope is obtained. We will explore Variability Items extensively in later Units.
5. Asset Usage is determined by a boolean TRUE/FALSE expression using the Options configured for bicycle variants. Hover over the expression to preview it.
6. Remain in the CO13 Handlebar Variable Component for the next exercise.



Usage Condition Editor

The Variable Component provides a sidebar window to facilitate viewing and definition of Usage Conditions to determine which specific Asset (e.g, Part, Document, etc.) is resolved given the Option selections made by the end user. This editor provides 3 Panes:

- **Feature/Options Tree**

  Provides a tree display of available Features and Options available for Usage Conditions expressions.
- **Assets Grid**

  Displays all eligible Assets, in this case Parts, that can be used to define handlebars on the bicycle when the 100% BOM is resolved.
- **Usage Condition Text Editor**

  Editing window for text expressions to define boolean conditions to determine Asset usage. See syntax below.

Usage Conditions Syntax

Usage Conditions are used to define the allowed usage of Assets within a Variable Component Item. These boolean expressions are associated with an Asset to indicate which is used when the conditions are met.

Examples are as follows:

- *[Bicycle Type] = [Mountain Bike] AND [Bicycle Size] = Medium*

  This Usage Condition allows the named Asset to be valid for Medium sized Mountain bicycles.

- *([Bicycle Type] = [Mountain Bike] AND [Bicycle Size] = Medium) OR ([Bicycle Type] = [Road Bike] AND ([Bicycle Size] = Medium OR [Bicycle Size] = Large))*

  This Usage Condition allows the named Asset to be valid for Medium sized Mountain Bikes, and or Medium or Large Road bicycles.

- *NOT ([Bicycle Type] = [Mountain Bike])*

  This Usage Condition allows the Asset to be valid on all bicycle types except for Mountain bicycles. Any newly added Options would allow usage, since this expression only excludes Mountain Bikes.

Syntax Guiding in the Editor

While typing Usage Condition expressions, the editor will provide intellisense assistance to help select logical operators (AND, OR, NOT) as well as syntax validation feedback to alert whether an expression is valid, or 'Incomplete or Invalid' during the input process.

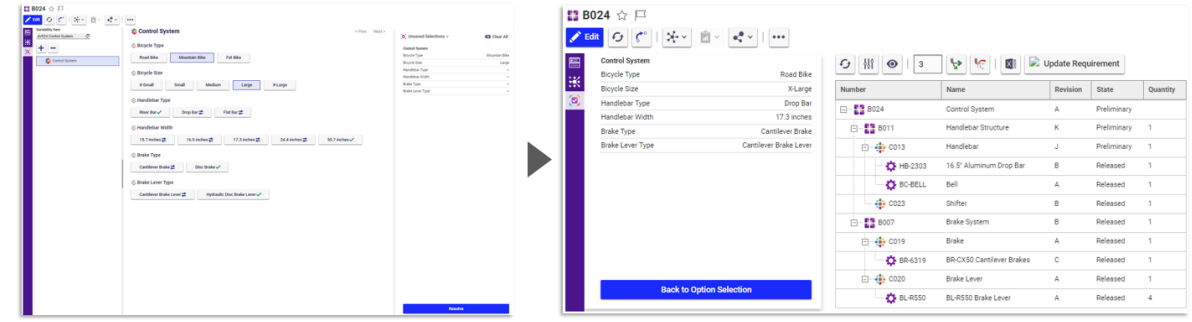
When the editor detects that "[*Feature Name*] =" has been typed, a pulldown of all eligible Options for that Feature will appear to assist with the correct completion of the expression.

Try It … Usage Condition / Text Expression Editor

1. Use the Sidebar menu to open the **Usage Condition Editor**.
2. Click to select a Drop Bar from the Assets Grid (lower right). An associated Usage Condition expression will appear in the Text Editor Pane. This is the **Usage Expression** evaluated by the system to determine that this Part is to be used in the variant when the expression is TRUE.
3. All saved Expressions are visible in the right most column of the Assets Grid.
4. You may close the Variable Component C013.

Resolving a Variant

- Resolution of a Variant from a variable configuration is done from the Breakdown Item using the '**Resolution**' window, accessed from the sidebar menu.
- A graphical interface allows Option selection (as constrained by Rules defined on the related Variability Item(s)



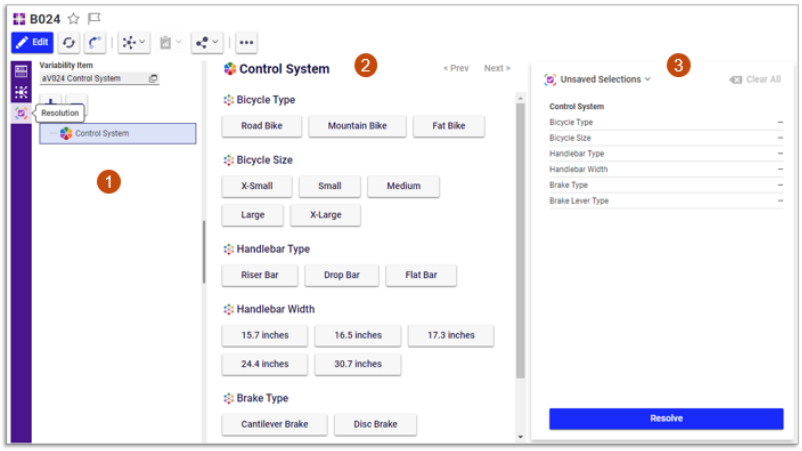
Resolving a Variant

Resolution of a Variant is performed in the '**Resolution**' sidebar window of the Breakdown Item. Options are selected from the set of all valid Options for each Feature. Option selection is constrained by Rules defined on the related Variability Item(s), which we examine in depth in the next unit.

When all Options are selected in a way that leaves no ambiguity for each Feature, the Variable Components can be resolved to a specific Asset based on defined Usage Conditions. We can say that the variable configuration has been resolved into a discreet variant - in other words, the 150% BOM has been resolved to a 100% BOM.

Breakdown Item / Resolution (Sidebar)

- The Resolution Sidebar contains 3 Panes:
  1. Variability Items Tree
  2. Feature-Option Selection
  3. Summary



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The 3 panes in the Resolution Sidebar window play cooperative roles toward discreet variant resolution. Option selections are made using the **Feature-Option Selection** pane (2).

Feature-Option Selection Pane

Valid Options for each Feature in a Breakdown Item structure are displayed as clickable buttons. The objective is to select all Options until there are no ambiguities to produce a discreet variant (e.g., the 100% BOM). The Option buttons provide the following visual feedback for making selections:

Mountain Bike	The gray background indicates that the **Option** is valid and not selected.
Mountain Bike	The blue background indicates that the **Option** is selected.
X-Small ⇄	The gray background with double-arrows indicates the **Option** is not selected, and it is an invalid choice in combination with existing **Option** selections.
Titanium ⊗	The gray background with a red X indicates the **Option** is not selected, and it is unavailable irrespective of the existing **Option** selections.
Aluminum Alloy ✓	The gray background with a green checkmark indicates that the **Option** is not selected, and it is the only valid choice for that **Feature** in combination with existing **Option** selections.

Summary Pane

This pane provides 3 main functions: (a) Display of all currently selected Options (b) a 'Resolve' button to display the resolved Asset structure (i.e., BOM) based on Option selections, and (c) the ability to save and restore Option selections made using the Feature-Options Tree. Selection sets can be assigned a name to be re-loaded, and used to recall a specific variant configuration later.

Variability Items Tree

Displays the Variability Item that is currently imposing Rules for Option selection. We will explore Variability Items in detail in the next Unit.

Try it…Resolve a Bicycle Control System

1. Open the **B024 Control System Breakdown Item** and open the 'Resolution' sidebar window.
   Experiment with Option selections and click 'Resolve' to see which specific Parts are resolved for each variant configuration. View the Resolved Structure pane to see the hierarchical view of the selected configuration.
2. Experiment by returning to Option Selection using the 'Back to Option Selection' button, changing the Option selections, and using 'Resolve' in the Summary Pane to view the differences in resolved structure resulting from alternate Option selections.
3. Click 'Back to Option Selection' to return from the Resolved TGV view and Save the selection set from the Summary pane. Click to clear all Selections.
4. Once cleared, (re)Load the saved selection set to recall the saved selection set, then Resolve again to check Assets.
5. Locate and open **B012 Bicycle Breakdown Item**, the top-level item in the structure and parent of Control System.
6. Examine the Resolution sidebar window to visualize the overall variable configuration to which B024 Control System belongs.

Checkpoint 01

So far, you've explored the essential components of Variant Management as presented in the TOC. You've seen how they work together to define variability and resolve discreet variants.

You should now be familiar with:

- Variant Management TOC Navigation
- Features and Options
- Breakdown Items and Structure
- Variable Components
- Assets and Usage Conditions
- Resolution of a specific Variant

Review Questions

1. How are the characteristics of a variable configuration defined?
2. Where is the "150% BOM" represented in Aras Variant Management?
3. Since there can be multiple Assets (e.g., Parts) for a component in the 150% BOM prior to variant resolution, what ItemType implements this one-to-many structure in Aras VM?
4. What determines the specific Asset that is used when Options are selected?
5. What happens when we select an Option in the Feature-Options Selection screen with double-arrows?
6. How can we recall a specific variant without re-selecting all specific Options?

Variability Items and Rules

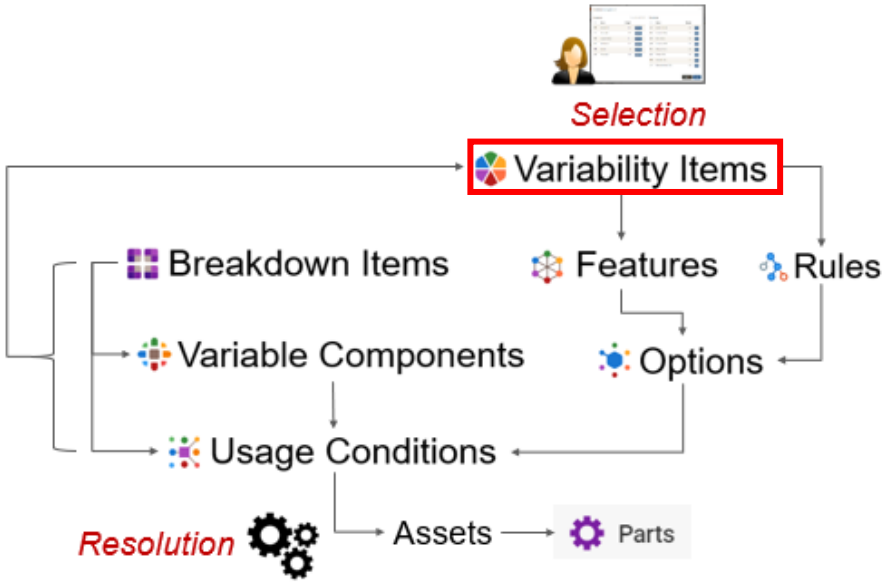
Overview

When resolving a variant, we saw that Option selections for each Feature are constrained to only the allowable combinations in the Option selection pane. For example, street tires are not an allowable Tire Size choice for the Mountain Bike type. Such constraints are implemented as **Rules** in a **Variability Item**.

In this section we will explain how variability is defined and applied in a variable configuration using Variability Items and Rules

Objectives

- Understand the role of Variability Items in Aras Variant Management
- Learn how Rules control selection of Option combinations
- Familiarize with the syntax of Rule expressions
- Learn how to test, save and load saved selections



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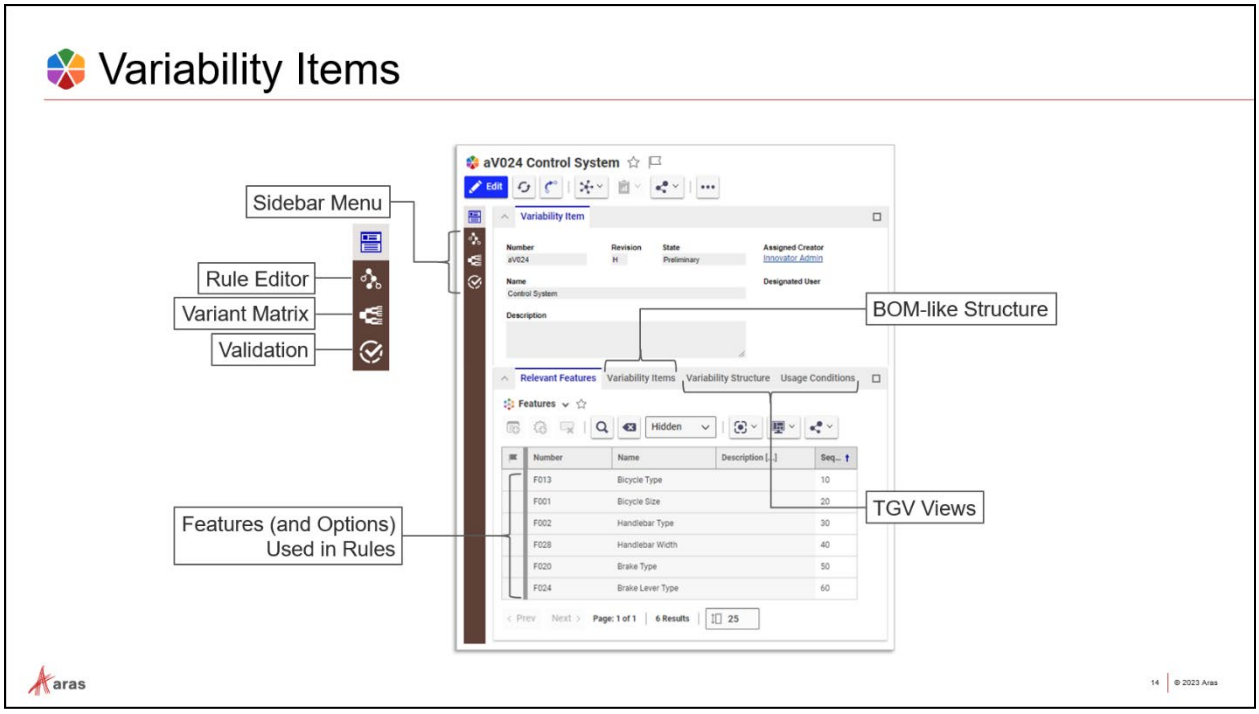


The Variability Item

Variability is configured in the **Variability Item** using **Rules** that restrict the way Options can be combined when resolving variants. Once defined, a relationship reference from another Variant Management item (e.g., Breakdown Item) applies the Rules from the Variability Item to the referencing item - thus, we can easily extend variability by referencing an existing Variability Item.

Relevant Features Tab

Each Variability Item contains references to relevant Features and their Options, which define the scope of applicability of the Rules defined therein. Rules can use any Options contained in Relevant Features in the syntax described in this unit. In this manner, selection of Features and Options listed here are controlled by these Rules wherever this Variability Item is used (e.g., Breakdown Items).

Variability Items Tab

Variability Items can also reference other Variability Items in a BOM-like manner, allowing modular reuse of Rules in multiple variable configurations. A reference to the top node in this structure applies all variability contained in the structure to the referencing object.

Specifically, all Rules defined throughout the variability structure apply when the top node is referenced, and all Relevant Features and their Options become available as well.

Variability Structure and Usage Conditions Tabs

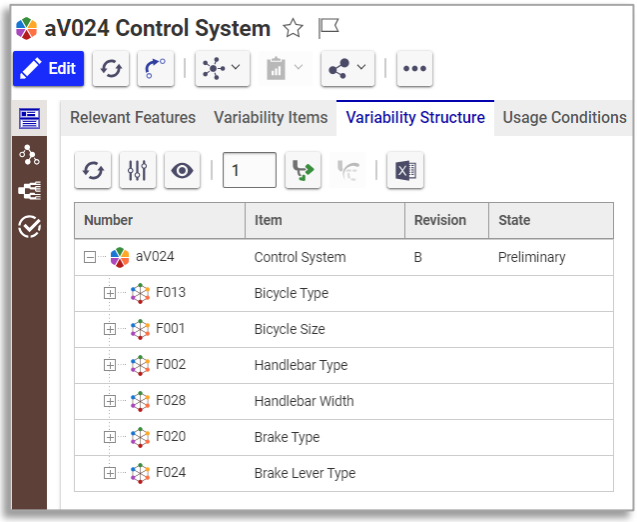
These TGV views provide views of the structure (analogous to BOM Structure tab in Parts) and a 'where used' view of Usage Condition items that reference this Variability Item, respectively. They are used for informational purposes only.

Variability Items are modular, reusable, and versionable. The Variability Item lifecycle ensures that references are fixed on Release just as Part->Part relationships are to enable configuration control within structures.

Try It

Examine an example of a Variability Item used in a Breakdown Item:

1. Navigate to Design/Breakdown Items in the TOC.
2. Search for and open **B012 Bicycle** Breakdown Item. Click to open the **Content** tab, which contains the related Breakdown Items in this structure.
3. From the Content grid, locate and open the **B024 Control System** Breakdown Item for viewing.
4. Under the *Variability Item* tab (third tab) select and open the **aV024 Control System** Variability Item. This is the item that contains all Rules governing the ability to select Options in combination with any other Options, i.e., it controls variability of the Control System.
5. Click to view the **Relevant Features** tab. These are the Features whose variability is controlled by this item. The Options from these Features can be referenced in Rules enforced by this Variability item.



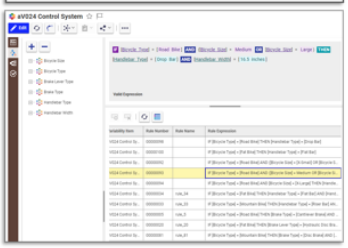
- The **Variability Items** tab (second tab) contains (BOM-like) relationships to other Variability Items. This allows reuse and modularity of Rules.
- The **Variability Structure** tab (third) is a TGV view of the structure. All Feature/Options from Relevant Features are included.
- Lastly, the **Usage Conditions** tab is a TGV that lists all references from Usage Conditions (e.g., where used).
- Leave aV024 Control System open for later steps.

6. Navigate to Variant Management/Variability Items in the TOC (or use Where used from the Navigate toolbar button) to open **aV012 Bicycle** Variability Item for viewing. Click to view its Relevant Features tab. Note that there are only two rows relevant to this top-level item.
7. Next open the **Variability Items** tab, note that there are several related Variability Item component items related to it (similar to Part->Part relationship).
8. Click to view the **Variability Structure** tab. All Options from Relevant Features, component Variability Items and their structures become aggregated into one structure at this level. The Rules defined in this Variability Item can include all Options in this total structure. The related Variability Items permitted re-use of all of the variability configured as components.

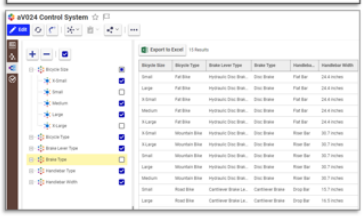
Variability Item – Sidebar Menu

Rule Editor	Create and edit Rules; selectively visualize Option constraints
Variant Matrix	Display a matrix of valid Option combinations filtered by selections
Validation	Preview Option selection (as used in Resolution), Save/Load selection sets

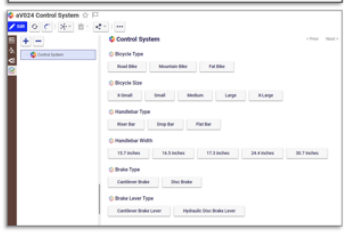
Rule Editor



Variant Matrix



Validation



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Sidebar Menu

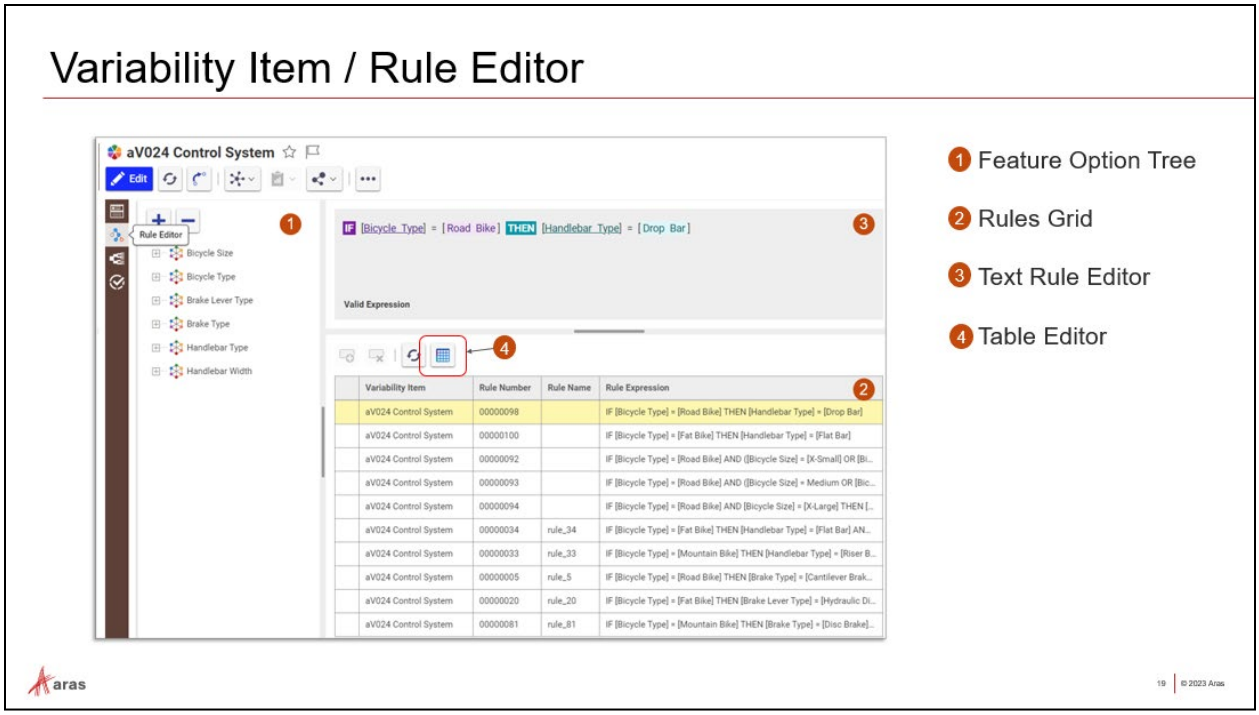
The Variability Item sidebar menu provides access to three additional user interfaces to complete the variability definition. Each can work with the entire scope of all Relevant Features, their Options, and any related Variability Items included in the relationship accordion tabs.

1. **Rule Editor**

   Provides tools for creating and editing Rules that control selection of Options when resolving variants.
2. **Variant Matrix**

   A grid that selectively displays all Rules in a matrix format, exportable to Excel.
3. **Validation**

   Interactive selection of Options as seen in the Resolution Pane on the Breakdown Item sidebar. This is used to validate your Rules before applying them to other Items.



Rule Editor (Sidebar)

The Rule Editor sidebar window provides three panes:

1. **The Feature/Option Tree**
   This tree displays all Options of Relevant Features from the entire Variability Item hierarchy. All Options shown are eligible for use in Rule expressions. Since Variability Items can have relationships to other Variability Items in a BOM-like structure, this tree contains the total of Features/Options under its own 'Relevant Features' tab, as well as those relevant to all child nodes.
2. **Rules Grid**
   This grid displays all Rules defined in the entire Variability Item hierarchy. Rules included from child nodes are read-only. Toolbar provides buttons to create new Rules, and to access the Table Editor (#4). Clicking on a row (Rule) displays the expression syntax into the Text Rule Editor. Rules displayed from child nodes in the Variability Item structure are read-only, but can be revised in their respective items as needed.
3. **Text Rule Editor**
   Used to edit/create Rules for this specific Variability item using the 'IF/THEN/AND/OR/NOT' expression syntax described below. Syntax is guided by suggestive feedback (intellisense). All Options in the Feature/Option Tree are available for Rule expressions.
4. **Table Editor**
   Intuitive Rule viewing and editing using a visual matrix with clickable cells rather than requiring manual typing of Rule syntax into the Text Rule Editor. Allows specification of Principal and Constrained Features and Options to assert implication/consequence logic. Rules are displayed and generated based on matrix selections.

Rules Syntax

Rules are defined as conditional expressions using Feature and Option names, and they can be as simple as a stated condition like *[FEATURE]=[OPTION]* or an implication/consequence pair:

IF [FEATURE1]=[OPTION1] THEN [FEATURE2]=[OPTION2]

and may include boolean operators:

=, AND, OR, NOT.

For example, a condition could allow either Aluminum Alloy or Carbon Fiber as Frame Material choices:

[Frame Material] = [Aluminum Alloy] OR [Frame Material] = [Carbon Fiber]

Or only allow Handlebar type to be "Riser Bar" if the bicycle is a Mountain Bike:

IF [Bicycle Type] = [Mountain Bike] THEN [Handlebar Type] = [Riser Bar]

(Refer to the Aras Variant Management User Guide for more detailed examples and definitions of syntax.)

Try It

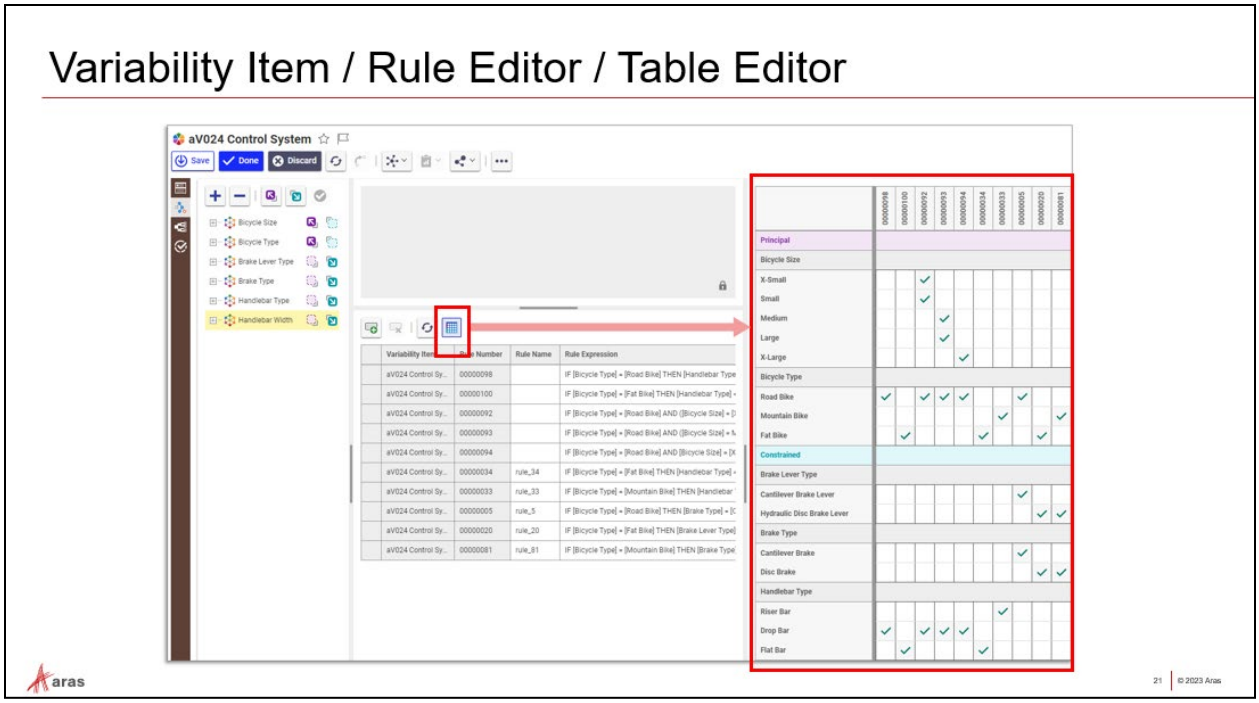
Examine the **Text Rule Editor** window and **Validation** Sidebar:

1. Navigate to Variant Management/Variability Items in the TOC and open **aV024 Control System** Variability Item (if not already open from previous exercise).
2. Use the **Rule Editor** Sidebar button to open the Rule Editor
3. Use the [+] button in the Feature/Option tree (pane #1) to display the Options under the relevant Features shown. These are the Features that were added to the 'Relevant Features' relationship tab on the main form.
4. From the Rule Grid (pane #2) select Rule #00000092 (third row from top). You should see this Rule expression:

   IF [Bicycle Type] = [Road Bike] AND ([Bicycle Size] = [X-Small] OR [Bicycle Size] = Small) THEN [Handlebar Type] = [Drop Bar] AND [Handlebar Width] = [15.7 inches]

   If the user selects Road Bike and X-Small bicycle size, then the handlebar must be 'Drop Bar' and the width of the handlebar must be 15.7 inches.
5. Examine Rule #00000093 and #00000094 – these Rules constrain Options for other sizes of Road Bikes.
6. Next, use the **Validation** sidebar button to open the Validation page. Note that it is the same user screen as we used in Breakdown Item resolution previously.
7. Select Road Bike Bicycle Type, and the bicycle sizes per the Rules examined in the Rule Editor. You should only be able to select the Options allowed by the Rules 00000092-94.
8. Next from the Variability Item Sidebar, use the **Variant Matrix** Sidebar button to open the Matrix window. Use the [+] button in the Feature/Option tree.
9. From the Features/Options tree select Bicycle Size Feature. This will check all its Options.

10. With the Feature Bicycle Type expanded, select only the Road Bike Option.
11. Scroll downward and check the Handlebar Type and Handlebar Width Features to select all of their Options.
12. Click the Get Configurations button to display the Matrix. The matrix can display some or all of the possible combinations allowed by the variability definition.
13. Keep **aV024 Control System** open for the next exercise.



The Table Editor

In addition to the Text Rule Editor, the Variability Item provides a Table Editor in this sidebar window that offers an intuitive alternative to manually typing Rules text. This additional editor is accessed from the toolbar button on the Rules Grid shown above.

Using selections from the Feature/Options Tree (far left pane), this tool generates an editable grid at far right whose rows are selected Options and columns are Rule conditions. Using mouse clicks instead of typed syntax, Rules can be configured visually.

Principal vs. Constrained Option Selection

Given that Variability Rule syntax requires an implication/consequence pair, Options can either be specified as Principal (implying) or Constrained. In simple terms, those Features and Options on the left of the 'THEN' operator in an expression are Principal or independent variables, and those on the right are Constrained or dependent variables.

To specify Principal vs. Constrained variables (Features and/or Options) use the Feature-Option Tree pane. Each Feature can be expanded to display its Options, or the entire Feature can be selected using either the Principal (purple) or Constrained (green) checkboxes displayed for each.

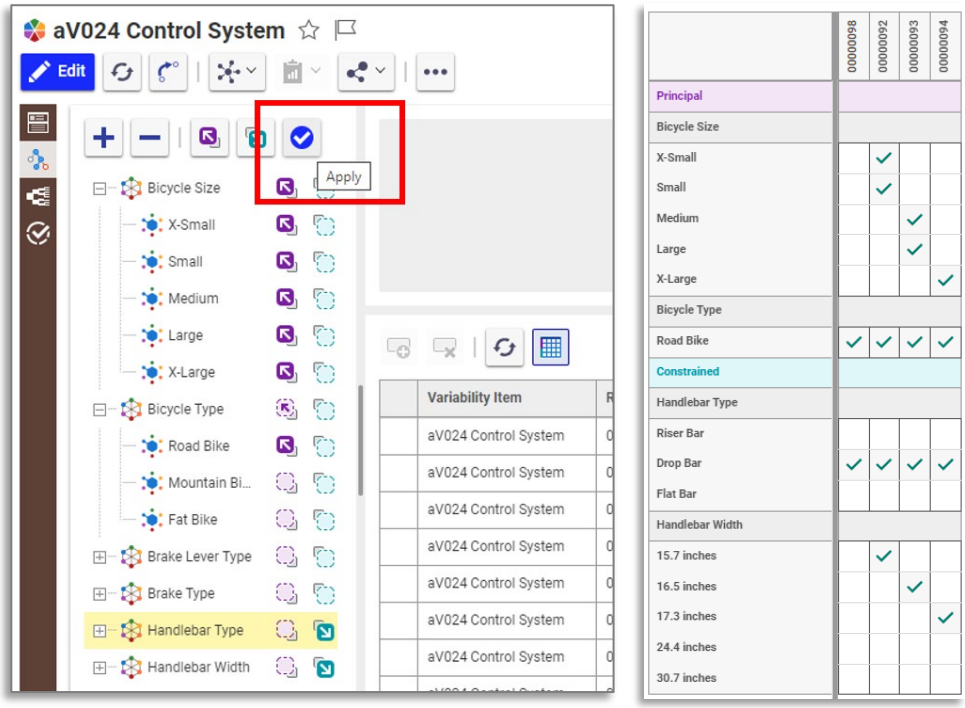
Rule Display and Editing from the Table View

The Table Editor initially displays existing Rules in the matrix format. If you have edit privileges, you may edit the Variability Item and create or modify the Rules directly from the table view.

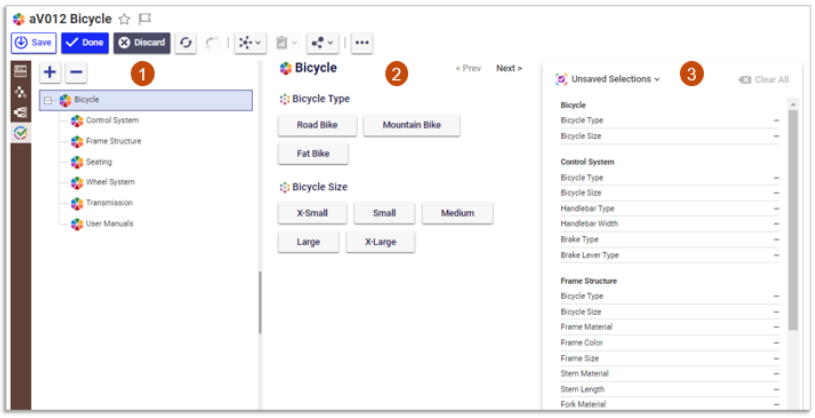
Try It

View **aV024 Control System** Rules in the Table Editor

1. Locate and click the **Table Editor** button on the Rule Grid toolbar.
2. You will see an initial table appear to the right with empty ‘Principal’ and ‘Constrained’ rows. This table will be populated once additional selections have been made.
3. On the Features/Options Tree, additional buttons will appear to allow selection of Options as ‘Principal’ and ‘Constrained’. In a Rule the expression used with ‘IF’ can be considered ‘Principal’ and those following ‘THEN’ can be considered ‘Constrained’
4. Set the ‘Road Bike’ Option under **Bicycle Type** to Principal in the Features/Options Tree.
5. Also set the **Bicycle Size** Feature as Principal, note that all Options become selected with the Feature.
6. Select Handlebar Type and Width as ‘Constrained’ and click the ‘Apply’ checkbox button.
7. Examine the Updated Table. It should reflect the same variability that we saw in the Validation sidebar window and the Text Rule editor.
8. Experiment with the various settings to examine the results.
9. You may close **aV024 Control System** if desired.



Variability Item / Validation



1 Variability Items Tree
2 Feature/Options Selection
3 Summary

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Validation (Sidebar)

The Validation sidebar allows users to preview the Rule behavior against the relevant Features and Options configured in the Variability Item. By providing the same Feature-Option Selection Pane as the Resolution screen we used in the Breakdown Item earlier, we can test variability as well as save/restore selection sets for variants.

The **Validation Sidebar** has 3 panes:

1. **Variability Items Tree Pane**

   This pane displays the structure of Variability Items under this level. Recall that Variability Items can be structured in a BOM-like manner, and their Rules and Relevant Features are aggregated for the referencing item.

2. **Feature-Options Selection Pane**

   This interface allows users to visually select Options while the system enforces variability Rules interactively. Here we can validate that the Rules configured in the Rules Editor Sidebar will provide the desired constraints during Option selection.

   You should recognize this pane from the Breakdown Item Resolution exercise. Any Breakdown Item adding a relationship to the Variability Item structure will implement the same selection constraints. The same Selection Pane and Option constraints will appear in both.

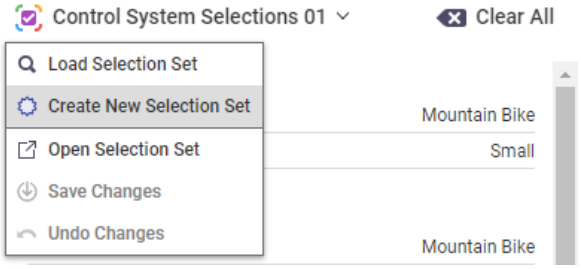
3. **Summary Pane**

   The Summary Pane displays the current selections made in the Feature-Options Selection Pane in a list format and allows Option selections to be saved and re-used wherever Option selection is done. For instance, when a selection set is saved it can then be used in a referencing Breakdown Item structure to produce a fully resolved variant (e.g., 100% BOM) in its Resolution Pane by simply re-loading it in the Summary Pane.

Try It

Validate and save a Selection. Load the saved Selection and view the results.

1. Open **aV012 Bicycle** Variability Item for viewing and select the Validation Sidebar menu to view the Validation screen.
2. Click to select **Control System** from the Variability Items Tree – this selection will display additional Options in the Feature-Options Tree pane.
3. Make allowable Option selections to complete a variant.
4. From the toolbar on the Summary pane (far right) choose the 'Create New Selection Set' option from the RMB and save your selections with an easily identifiable name and number.

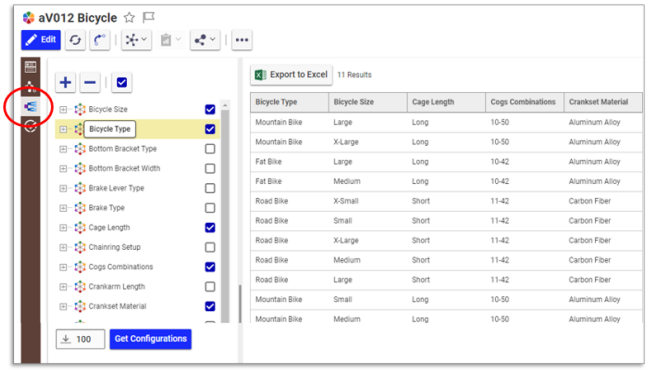


5. You can now use 'Clear All' to de-select all Options without losing them.
6. Navigate to Design/Breakdown Items in the TOC
7. Search for and open **B024 Control System** Breakdown Item for viewing.
8. Use the Resolution sidebar button to open the Resolution window.
9. In the Summary pane (far right) use the Selections pulldown menu to load your previously saved Selection Set. A search dialog will appear from which you can locate the saved Selection Set.
10. Load the saved Selections to apply your Option selections made in the Variability Item to the Breakdown Item.

Variability Item/Variant Matrix

Variant Matrix (Sidebar Menu on Variability Item) allows selective viewing of valid Option combinations

- Choose which Features and/or Option Combinations to Display
- Exportable to Excel



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Variant Matrix

Another useful variability tool is the Variant Matrix view, accessible from the Variability Item Sidebar. It allows you to selectively generate a grid (matrix) of valid Option combinations in the right-side pane for a given selection of Feaure/Options in the left-side pane.

Try It

Generate a grid view of valid Option combinations based on selected scope items:

1. Open **aV012 Bicycle** Variability Item.
2. Open the Variant Matrix from the Variability Item sidebar menu.
3. Use the Feature/Options Tree to select from the hierarchy of items in the variability scope and use the 'Get Configurations' button to display the permuted matrix of valid options.
4. Experiment with various Feature/Option Tree selections.
5. Try exporting to Excel if desired.

SUMMARY

In this section we explored the Variability Item and its ability to configure Rules to constrain selection of Options across its structure and Relationships. Using the Rules Editor, Variant Matrix, and Validation sidebar windows we examined and exercised Rules, viewed permuted combinations, and verified selection behavior.

You should now be familiar with:

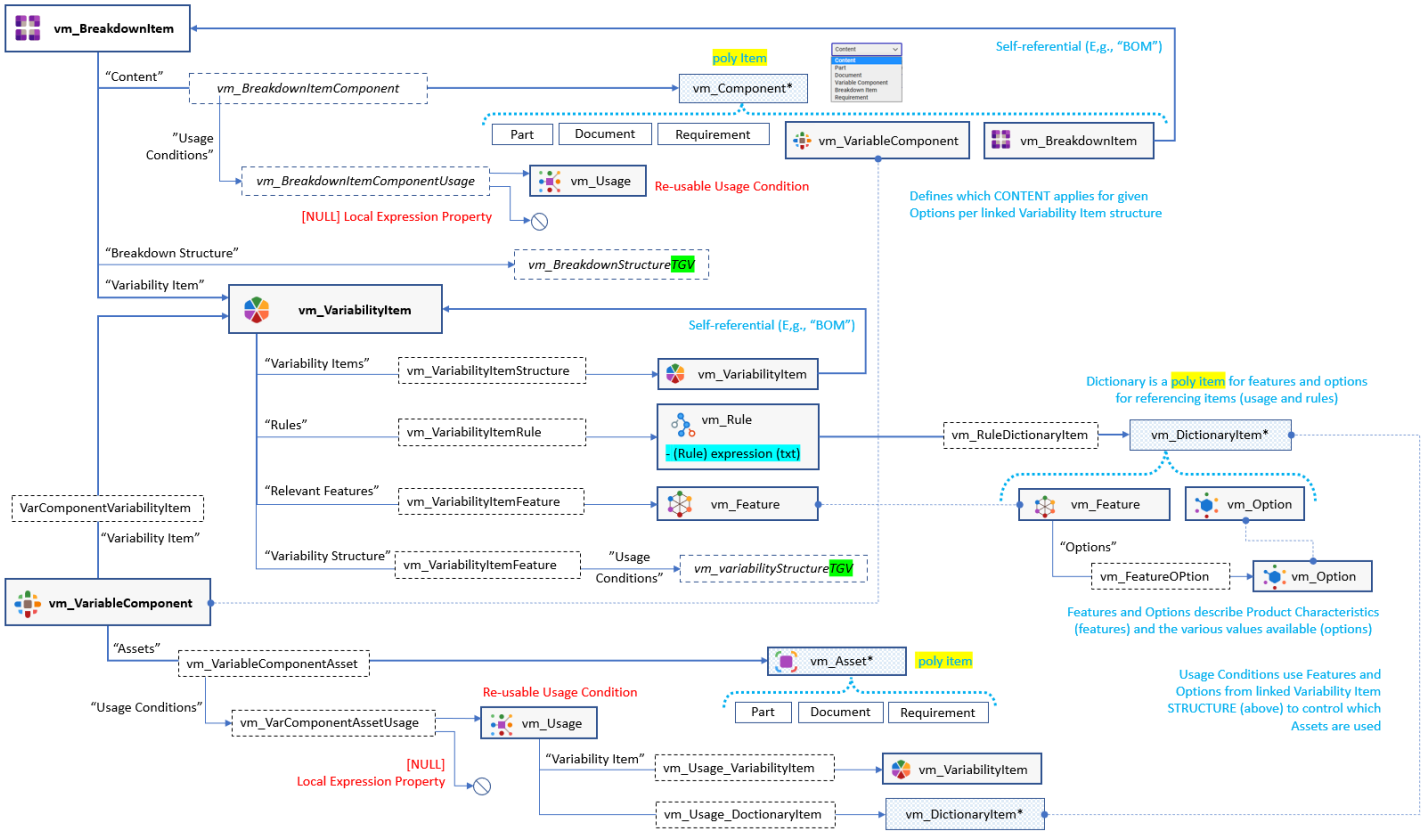
- The Variability Item structure (BOM-like) and aggregation of Features and Rules
- Sidebar access to Rule Editor, Variant Matrix and Validation windows
- Rules Syntax, Text and Table-based editors
- Applying variability to Breakdown Items, Variable Components, and Usage Conditions
- Saving and restoring Option Selection Sets

Review Questions

1. What determines the scope of eligible Options for use in Rules in a Variability Item?

2. What is the difference between the selection pane in the Variability Item Validation sidebar window vs. the Breakdown Item Resolution sidebar window?

3. If I revise a Variability Item that is used in a structure (E.g., Breakdown Item, other Variability Item, etc.) will it be updated in the referencing source item automatically?

4. Can I add a Rule without any of the following operators: (IF, THEN, AND, OR, NOT)?

Aras Variant Management Data Model