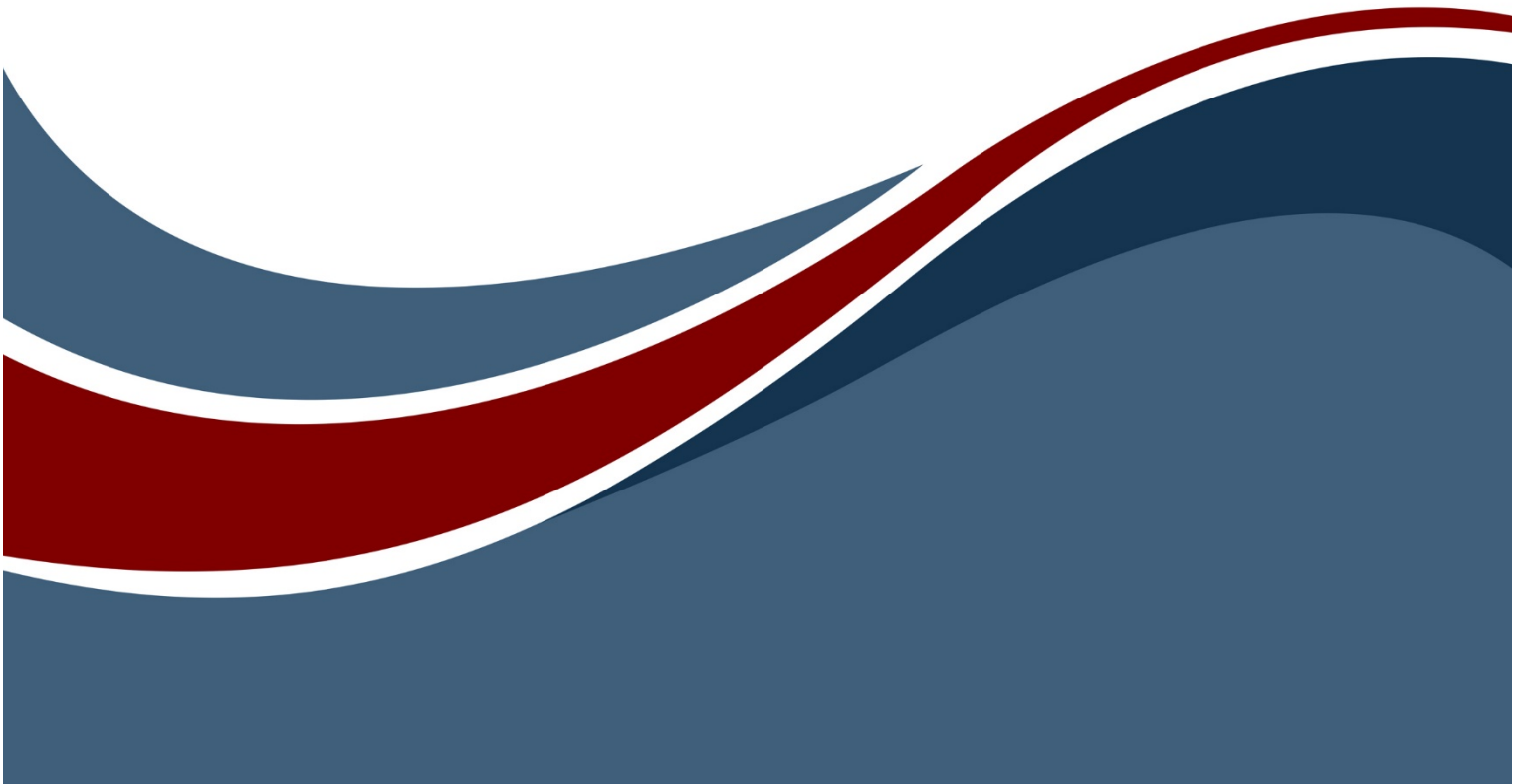




# New Features Guide



## GENESYS 2020 R2 New Features Guide

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## CUSTOMER RESOURCE OPTIONS

Supporting users throughout their entire journey of learning model-based systems engineering (MBSE) is central to Vitech's mission. For users looking for additional resources outside of this document, please refer to the links below. Alternatively, all links may be found at [www.vitechcorp.com/resources](http://www.vitechcorp.com/resources).



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### GENESYS 2020 R2 OVERVIEW

A fundamental strength of GENESYS is the auto-generation and automated maintenance of diagrams. Rather than requiring users to create and maintain every diagram by hand – a time consuming and error-prone proposition – the view generators in GENESYS translate the system “source of truth” into diagrams on demand. This enables users to engineer in their chosen diagram and communicate, update, and refine using other diagrams, always confident that the rich portfolio of views reflects the latest changes with guaranteed consistency.

GENESYS 2020 R2 takes this capability to a new level. It has always been possible to construct with the ease of Visio. Now, richer formatting options offer greater control over node shapes, content (now on a per-node basis), and font decoration. This latest release of GENESYS also addresses the one possible drawback of auto-generated diagrams – their technical completeness. From an engineering perspective, it is essential to have a complete picture. However, for communication purposes, sometimes it is desirable to hide certain information in order to focus on other aspects. GENESYS 2020 R2 enables this fluidity with rich control over the elision of diagram content, permitting you to present – and hide – information to enhance communication and understanding.

Manual formatting is good, but automated formatting is even better. Now you can define rules – no programming required – to control the formatting of your diagrams. Show all risks as octagons to call attention to these critical entities. Highlight all entities with completeness or integrity issues so that you know where your work is incomplete. Hide the mechanical and electrical connections so that you can focus on data links. If you can imagine it, you can do it with rule-based formatting.

With so much formatting at your control, it would be great if you could have multiple views of the same diagram (or viewpoint if you prefer) for a given entity. Now you can have as many as you wish. Lay out your base internal block diagram to show the complete technical system schematic. Store a different view using graphics to create an archtoon for stakeholders. Use rule-based elision to create a different view for each type of connection: structural, electrical, data, etc.

While the undisputed highlight of GENESYS 2020 R2 is its best-in-class diagramming framework complementing the auto-generation and maintenance-free diagrams, there is more to it than just diagramming. Enjoy enhancements in usability as we refine the drag-drop framework with external objects. Take advantage of performance improvements in the simulator as you dynamically validate your behavioral architecture. Improve your management of risks with schema changes to better address mitigation activities.

## ENHANCED FORMATTING FOR DIAGRAM CONTENT

Within GENESYS, the diagram properties set the overall format of the diagram – what information is shown on each node; coloring for nodes, lines, and the diagram itself; sizing; specific diagram options. The user then had additional control over the formatting of each node and line with options such as color, size, opacity, and whether to display a node as a box or an image. GENESYS 2020 R2 dramatically increases the range of formatting options you can apply to nodes and lines.

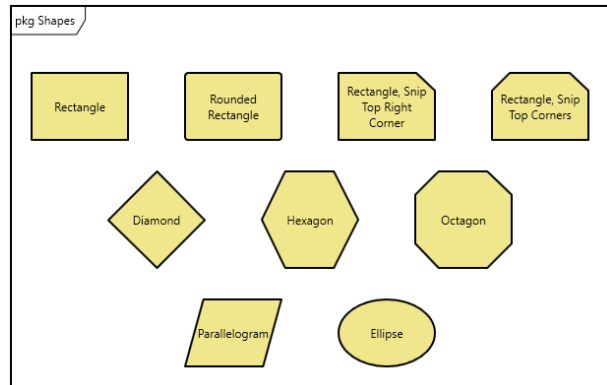
### Node Shape

GENESYS now allows you to change the shape of the node on a diagram. No longer are you constrained to rounded rectangles on a hierarchy diagram or ovals on a use case diagram. Change the shape to highlight a given node, to make a specific class of entity stand out, or emulate a different diagram type. With control over the node shape, you can transform a generic hierarchy diagram or spider diagram into a fault tree, goal structure notation, and more.

Manually set a node shape to

- diamond
- ellipse
- hexagon
- octagon
- parallelogram
- rectangle
- rectangle with a snipped top right corner
- rectangle with snipped top corners
- rounded rectangle

or leave it as “automatic” to use the base node shape for the diagram.



### Line Weight and Style

With GENESYS 2020 R2, you can control the weight and style of lines – the borders of nodes and selectable lines on any diagrams. Weight can be thin, medium, or thick to differentiate nodes for any purpose. Line style can be solid, dotted, or dashed.

Note that when applying line weight and style options to a node, the formatting only affects the border of the node. Any internal separators within the node are still controlled by the node template.

### Template

GENESYS traditionally allowed you to set the template for various node types on a diagram (e.g., activity nodes might show number and name while the corresponding items only display their name). In GENESYS 2020, you were given more control with the ability to specify a template for diagram lines that represent entities. For example, on an internal block diagram, you could control whether a connecting line showed the name, abbreviation, or nothing.

With GENESYS 2020 R2, you can now control the template on a per-object basis. Toggle specific nodes to show their descriptions for greater insight. On a block definition diagram, show parameters for selected components and show only the name for others. On a physical block diagram, set certain connecting lines to an empty template, highlighting only the fact that nodes are connected. Whatever you choose to do, present your information your way with maximum flexibility.

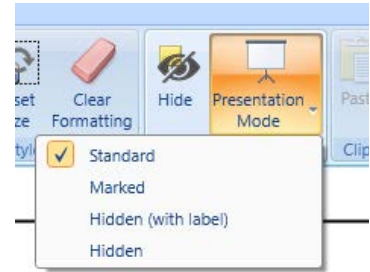
### Font Decoration

With this new release, select any diagram object and toggle the font decoration to enhance communication. Bold the font to highlight important entities. Use italics to identify proposed changes. Use strikethrough to suggest deletions. You have the control. You choose the meaning.

## HIDING DIAGRAM CONTENT (ELIDING CONTENT IN THE LANGUAGE OF SYSML)

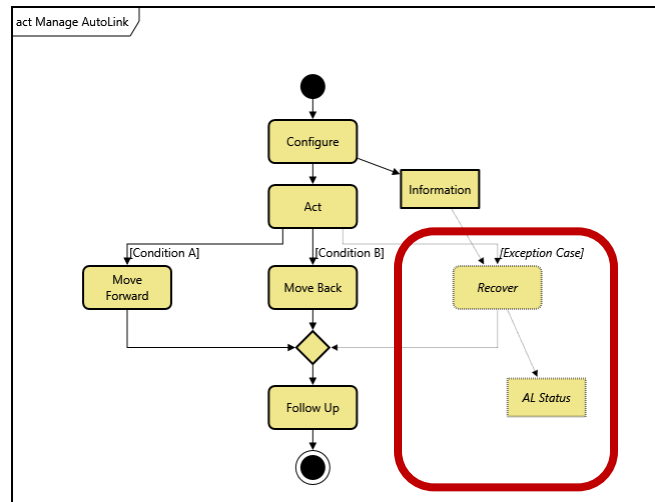
GENESYS has always excelled at presenting technically correct and technically complete graphic representations. Unfortunately, comprehensive and complete diagrams can complicate communication. With GENESYS 2020 R2 you can now elide content, selectively hiding / showing nodes and lines on diagrams. Deliver comprehensive, complete, correct representations from the underlying model with complete control over the presentation. Focus audiences on the areas of interest while hiding other content without having to manage and synchronize separate artifacts.

Individual diagram objects can be selected and marked to hide / show. Diagrams now support four specific presentation modes to leverage this capability.

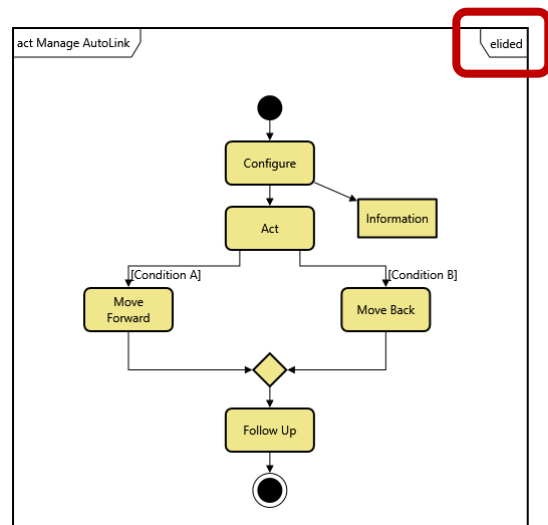


- Standard.** This display mode maps to the traditional GENESYS view. All diagram content is shown. No visible markings indicate any diagram objects that have been marked to hide. The standard view is most appropriate for engineers and analysts as they architect and define the system.
- Marked.** To help manage which objects are marked to be hidden, the Marked presentation mode shows all diagram content but shows content that will be hidden with dotted lines and italics text. When leveraging the show/hide capability, this mode is essential to managing diagram appearance.

Eliding one node on a diagram will also elide dependent content. For example, if you elide a function on an activity diagram, any item that is not related to a function marked to show will be hidden. Likewise, on a block diagram, if a node is marked as elided, all corresponding connections will be hidden.



- Hidden (with Label).** In this mode, diagram content marked to hide is hidden from view. This could be individual nodes, constructs, or entire branches. Layouts are compacted such that there is no layout cue that content is missing. Dependent objects (for example, items on an activity diagram that are not connected elsewhere on the diagram) are also automatically hidden. The diagram frame is marked in the upper-right corner to indicate that content has been hidden.
- Hidden.** This mode is the same as the Hidden (with Label) mode but without the diagram frame marking. This mode is most appropriate for use with customers so that they can focus on the diagram content (rather than thinking about what has been hidden).



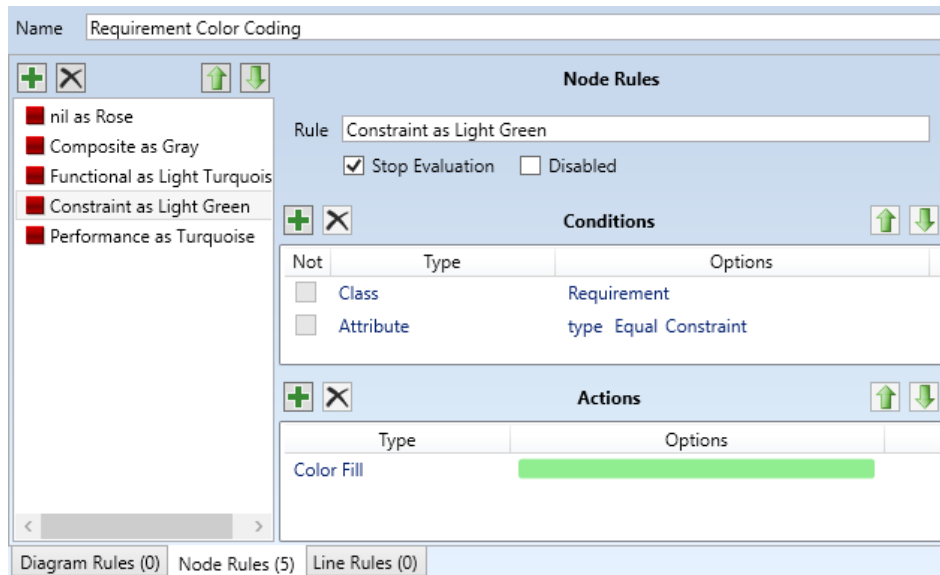
## RULE-BASED FORMATTING FOR RICH, EFFORTLESS VISUALIZATIONS

The new formatting options in GENESYS 2020 R2 provide you great control over your diagram. The ability to apply the formatting options via a simple rule-based framework takes the diagramming capability to another level. Show all requirements of type constraint in pink. Use thick lines for all electrical connections to highlight these interfaces. Elide all phase 2 functionality from the activity diagram, showing only the phase 1 capabilities. The options are endless.

From the utilities section of the project explorer panel or from the property sheet of a diagram, create or edit a new rule set. (To get started, import *Sample Rules.gnsx* from the Extensions folder to explore several options.) Each rule set consists of one or more rules broken into three areas:

- **Diagram rules** allow you to override the main diagram styles for node and construct templates. Apply a rule to quickly change all node shapes on a hierarchy diagram to parallelograms with special coloring. Adjust an EFFBD to use a diamond for a select construct.
- **Node rules** allow you to control the formatting of specific nodes on a diagram. When the diagram is drawn, the node rules run against each node to set the formatting. Change the shape of a risk node to an octagon. Change the fill color of a node with diagnostic errors to red. Hide a function which won't be available until a future sprint.
- **Line rules** operate the same as node rules, running against each line where the line represents an entity. Particularly useful on the physical and internal block diagrams, elide the non-data connections. Change the line style based upon the link type to quickly distinguish the different types of connections.

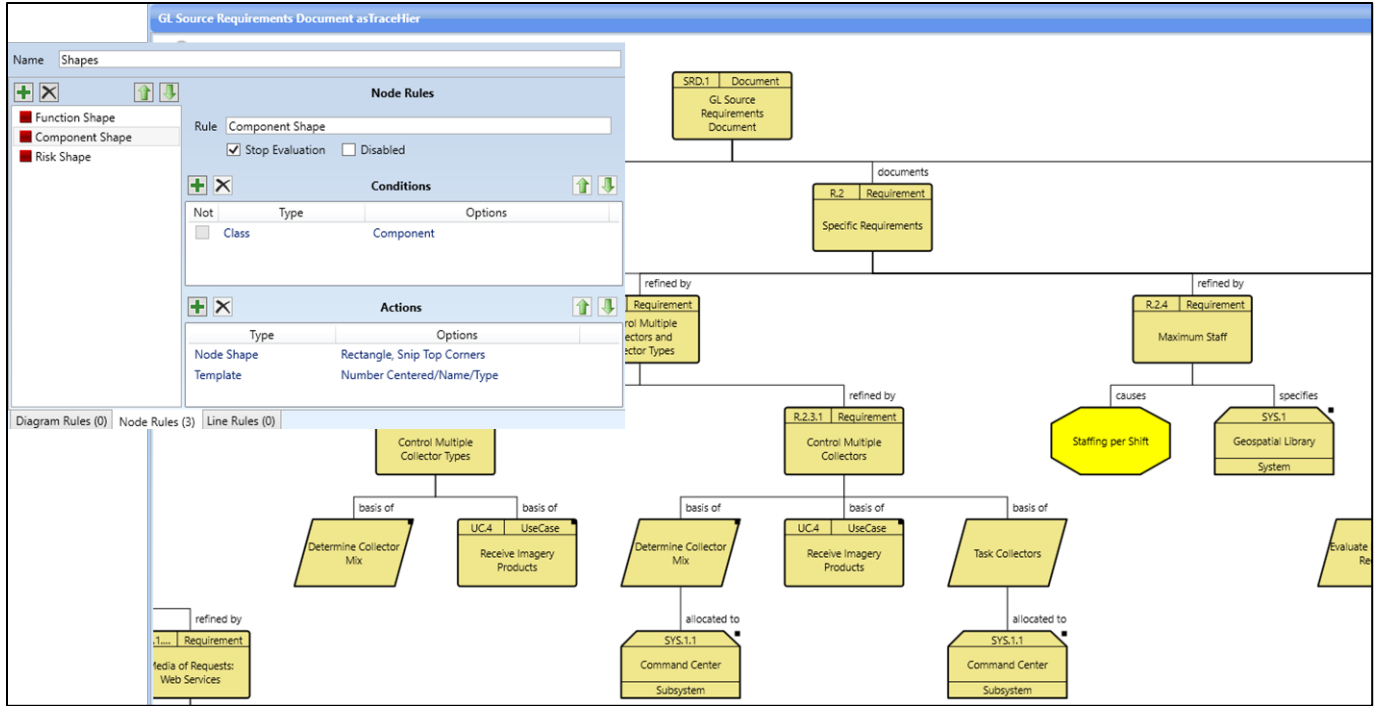
Each rule consists of a set of conditions and a set of formatting options applied when that condition evaluates to true. Best of all, no programming required! The interface uses a series of drop-downs allowing you to specify the rules you need to get the formatting you desire.



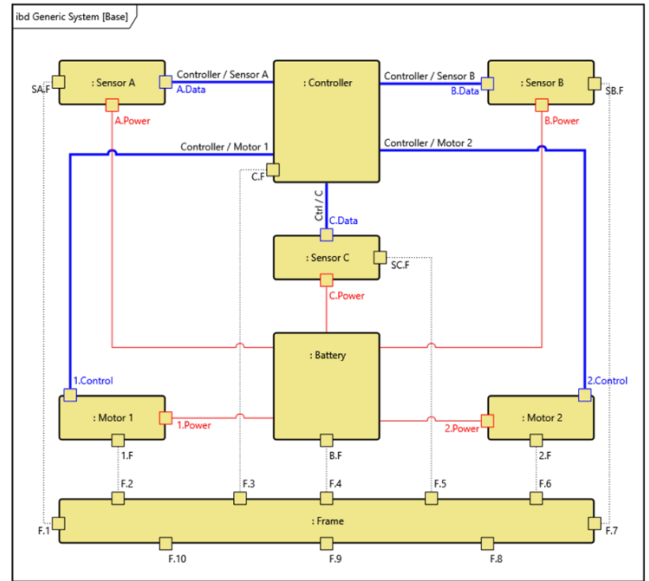
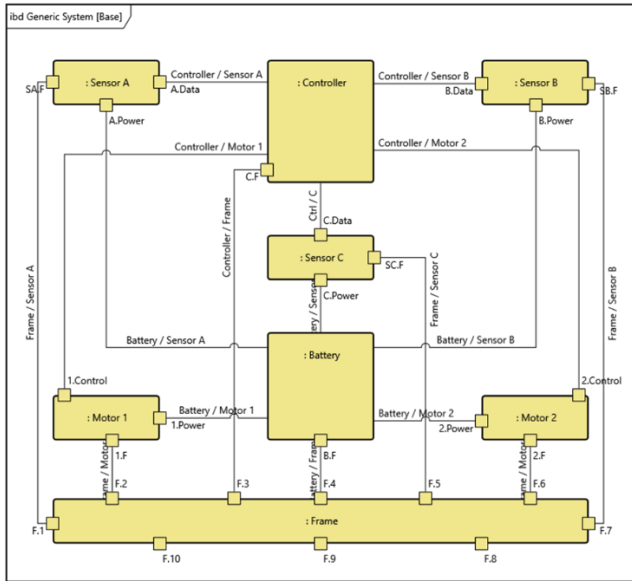
Applying a rule to a diagram is as simple as selecting it from the drop-down on the property sheet. The result is diagrams with engineering substance automatically generated and maintained with automatic formatting to enhance communication and analysis.



# GENESYS 2020 R2 New Features Guide



**Class-based rules to control node shapes on a hierarchy diagram**

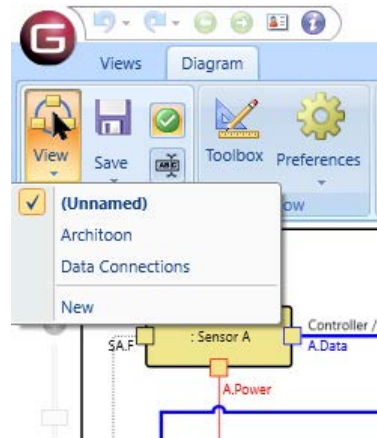


**Type-based rules to differentiate structural, electrical, and data connections on an IBD**

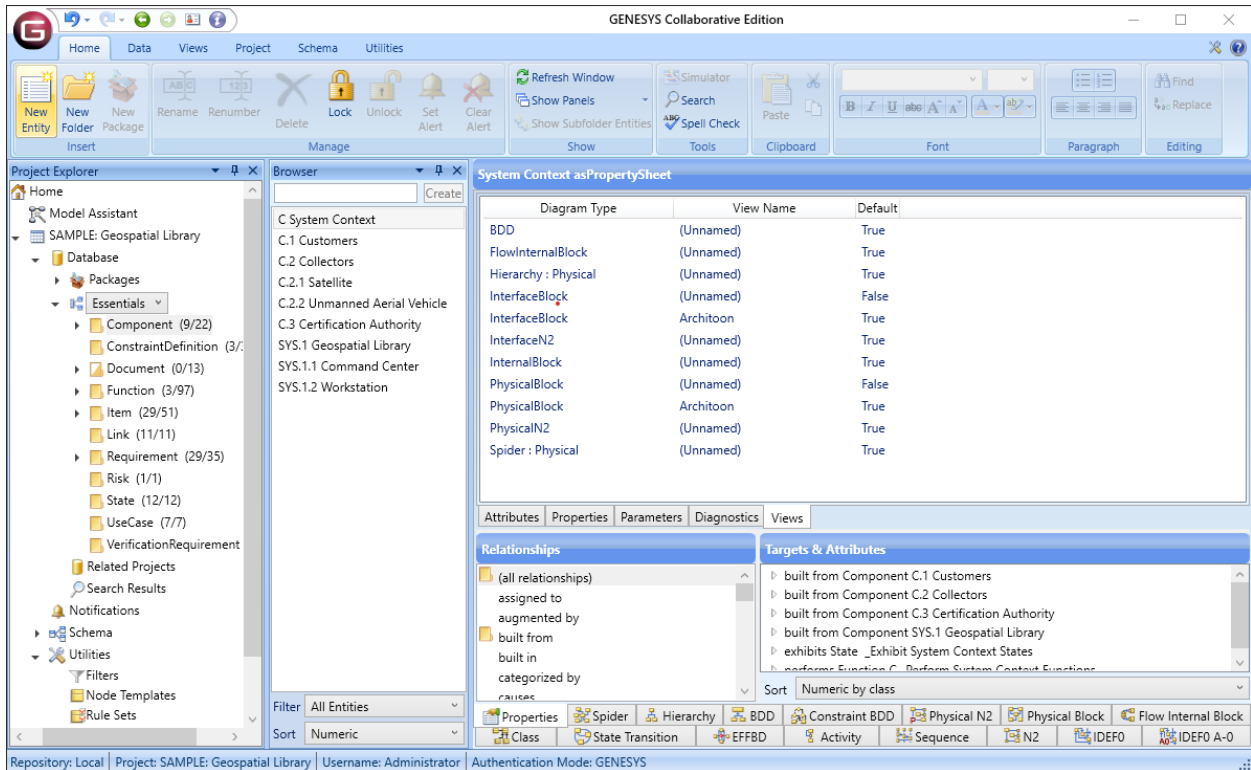
## MULTIPLE VIEWS PER DIAGRAM TYPE TO ENHANCE UNDERSTANDING

With all of this powerful formatting capability, it would almost be unfair to limit you to just one visualization per diagram type for a given entity. Not to worry – with GENESYS 2020 R2 you can have as many views as you like. Have one IBD to represent the as-is capability and a second to represent the phase 2 upgrade. Capture a technical diagram and an architoon. Separate electrical and data interfaces. As your system definition evolves, GENESYS automatically maintains the technical content of every view for guaranteed consistency. You control the formatting of each view to deliver just the right impact.

Using the views commands on the Diagram ribbon, name your view. From the drop-down below the Save command, select Save as to create a new view. Select the view you want from the View drop-down. Click the check mark to identify the default view for this diagram type.



A new Views tab on the property sheet provides quick access to all of the views for a given entity. Manage the views directly from this tab – setting the default, renaming, and deleting. Or double-click a view to quickly open it.



### ADDITIONAL REFINEMENTS

#### ***Clear Formatting from Diagram Objects***

With the enhanced formatting capabilities, sometimes you simply want to clear all of the manual formatting. Select one or more nodes and clear all of the manual formatting – colors, shape, template, line weight and style, font decoration – everything except sizing and elision. If you want to clear formatting for everything on the diagram, simply click the command with nothing selected.

#### ***Additional Key Entities Classes***

The Key Entities folder in the diagram toolbox provides quick access to all of the classes represented on the diagram. In GENESYS 2020 R2, the list of classes has been expanded to provide quick access to additional entities considered when using the diagram for analysis (as opposed to only the subset of classes shown via diagram nodes and lines). Specifically, the following additions have been made:

- Activity – target classes for the *allocated to* relationship enabling quick allocation
- FFBD and EFFBD – target classes for the *allocated to* relationship enabling quick allocation
- N2 – target classes for the *allocated to* relationship enabling quick allocation when performing clustering analysis
- Flow Internal Block – target classes for the *transfers* relationship to reflect the items exchanged across a connection
- Physical Block – target classes for the *transfers* relationship to reflect the items exchanged across a connection

#### ***Extending Drag-Drop from Windows***

GENESYS 2020 introduced the ability to set an entity's image or associate a file simply by drag-dropping a file from Microsoft Windows. GENESYS 2020 R2 extends this capability allowing you to quickly establish hyperlinks. If an entity has any attributes of type Reference Spec (e.g., the external file path for documents), drag-dropping a file onto the entity now allows you to select from three options: set the image, associate the file, or set the attribute to establish a hyperlink.

#### ***Improved Simulator Performance***

Simulations now execute approximately 3.5x faster than before. With these improvements, dynamically validating your behavior to ensure logical consistency, ensure system performance, and identify resource contention is quicker than ever.

### GENESYS 2020 R2 SCHEMA CHANGES

#### ***General Changes***

1. VerificationEvent is now essential. Given the essential relationships with several essential classes, the VerificationEvent class is assumed to be present in all schemas.
2. Item is now part of the Essentials facility. Items are key in the definition and management of interfaces, and therefore Item is included in this minimal list of classes.

#### ***Risk***

When working with risks there are at least two defined parts – identifying the risk and determining how to respond to the risk. Previously these have been combined in the Risk entity. Given our experience and industry practice, GENESYS 2020 R2 versions of the baseline schemas have separated Mitigation Activities from Risk. This allows for better risk management since determining a risk occurs separately from putting mitigation activities in place.

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The GENESYS 2020 R2 versions of the baseline schemas will include the following changes. Note, projects may continue to use prior versions of the schema with no changes to capability.

1. Data migration
  - a. For all **Risk** entities with a mitigation plan attribute value, create a new **MitigationActivity** entity associated with the **Risk** using the *mitigated by* relation with description set to the mitigation plan value.
  - b. Transform **Risk** Status values as described below
  - c. Transform **Risk** Type values as described below
2. Deletions
  - a. Relation *resolved by / resolves*
3. Additions
  - a. Class **MitigationActivity** (parent class **ProgramActivity**)
  - b. Relation *comes from / leads to*
  - c. Relation *mitigated by / mitigates*
4. Class changes
  - a. **ProgramActivity**
    - i. Added attribute Planned End Date
    - ii. Added attribute Planned Start Date
  - b. **Risk**
    - i. Added attribute Handling Approach
    - ii. Added attribute Risk Score
    - iii. Added attribute Scoring Rationale
    - iv. Removed attribute Mitigation Plan
    - v. Removed attribute Mitigation Cost
    - vi. Renamed Risk Effective Date to Trigger Date
    - vii. Revised Status values
      1. Removed Closed (migrated to Retired)
      2. Removed Open – Mitigated (migrated to Proposed)
      3. Removed Open – Unmitigated (migrated to Proposed)
      4. Added Proposed
      5. Added Active
      6. Added Realized
      7. Added Retired
    - viii. Revised Type values
      1. Removed Logistics (migrated to Programmatic)
      2. Removed Other (migrated to nil)
      3. Removed Requirements (migrated to Technical)
      4. Removed Test and Evaluation (migrated to Technical)
      5. Added Programmatic
    - ix. Added relation *comes from* Risk
    - x. Added relation *generates* ChangeRequestPackage
    - xi. Added relation *leads to* Risk
    - xii. Added relation *mitigated by* MitigationActivity
    - xiii. Removed relation *resolved by*
    - xiv. Removed relation *results in*

### **RequirementGroup and VerificationRequirementGroup**

When managing requirements and verification requirements, it may be desirable to manage a set of requirements within a shared context. This shared context could be for many different semantic purposes – for elicitation, traceability, verification, etc. Leveraging this shared semantic context then simplifies the management of relationships. For example, if a requirement group specifies a given component, it follows that all requirements contained within that group specify the component.

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To support the concept of groups, ElementGroup has been added as a subclass of Element. The differentiation between the concept of ElementGroup and the existing concept of Category and Package is semantics. Category is a way to cluster entities with no pre-defined semantic meaning. Package clusters entities for model management purposes. Both Category and Package cluster many different types of classes. You can choose to add greater semantic meaning to these concepts, but there is not pre-existing meaning. However, in the case of ElementGroup, there are very strong semantic meanings with the semantics of the group flowing to the grouped entities. Therefore, the entities within a group are homogeneous.

Two subclasses of ElementGroup have been defined in the GENESYS 2020 R2 schema:

- RequirementGroup (with the attributes, relationships, and semantics of Requirement),
- VerificationRequirementGroup (with the attributes, relationships, and semantics of VerificationRequirement).

### **Type for Links and FullPorts**

When modeling connections between components, there are many types of connections – notably data, electrical, human, mechanical, structural, and thermal. To help separate these aspects of the connection for visualization and specification purposes, a type attribute has been added to both the Link and FullPort classes. The enumerated list of types is identical for both classes, and a standard design integrity check confirms that the type of a Link and the associated FullPort are the same.

### **Minor Changes**

1. A queueType attribute has been added to the *inputs / input to* relationship. This parallels the queueType variable on the *triggers* relationship and specifies how the input entities should be ordered for the receiver of the input. This allows modeling of FIFO, LIFO, priority, and reverse priority queues (with FIFO being the default specification).
2. The attribute order for UseCase has been revised with the UseCase-specific attributes now in the order: preconditions, postconditions, primaryFlow, alternateFlow. This better clusters pre- and post-conditions. These two attributes also provide the context for the narrative flow attributes and therefore should precede them in the default attribute order.
3. Attribute Cost for ImplementationUnit classes (e.g., Component) has changed to a parameter. This allows the cost to be set for only those entities that require it. Migration of entities with a cost associated will add the parameter and assign the value to the objective field.

### **Migrating Projects from pre-2020 R2 Schemas**

Given the nature of the schema changes made in the 2020 R2 base and Capability Architecture Definition schemas, project migration is required to transform specific classes and specific attributes. To best support this migration, GENESYS 2020 R2 provides a schema migration utility on the Project tab.

This utility is targeted at the standard Vitech schemas. If your project uses a customized schema, additional migration support may be required. If you have made schema extensions and would like to understand what special steps – if any – are required to support your extensions, please contact [Vitech Customer Support](#) with a copy of your extensions. We are happy to review these and advise you in your migration accordingly.

**Note:** You do **not** have to migrate your schema in order to make use of GENESYS 2020 R2. You should assess your project needs, your project lifecycle, and the changes present in the 2020 R2 schemas to determine if, and when, to migrate your schemas. Project teams nearing a major milestone or approaching conclusion should strongly consider remaining with their current schema. We recommend that others move to the 2020 R2 schemas to take advantage of the latest improvements in the systems engineering metamodel.



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