

# User Guide

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## Getting started

- Introduction to Cameo Simulation Toolkit
- Key features
- Simulation project template

## Model simulation

- Elements simulation
  - Behavior
    - Activity
    - State Machine
    - Interaction
  - Class
  - Diagram
  - Instance Specification
  - Table
- Simulating a Simulation Configuration
- Subset property

## Simulation Configuration and UI modeling

- SimulationConfig stereotype
- Simulation log
- Simulation time and simulation clock
  - Built-in clock
  - Internal simulation clock
  - Model-based clock
- Automatic start of active objects
- UI modeling diagram simulation
- ImageSwitcher and ActiveImage
  - Representing object states
  - Representing enumeration values
- Time series chart
  - Specifying time axis' range in a Time series chart
  - Exporting plots data
    - Exporting plots data to a CSV file
    - Exporting plots data to an instance model
  - Saving plot results to the model
  - Representing data from a CSV file in a line chart
- Timeline chart
- Histogram
- Nested UI Configuration stereotype
  - Representing parts of a simulation context
  - Representing parts using existing UI Configurations
- Reusable UI Mockup
- CSV export
- Nested property selection for configurations
- Web Server for Cameo Simulation Toolkit
  - Auto-generating web project homepage
  - Auto-generating HTML files
  - Generating an HTML table from a UI table, Time series chart, and CSV export configuration
  - Control panel for Web UI
  - Image switching in web user interface
  - Plotting on the web user interface

## Animation

- Active, visited, and last visited elements
- Customizing animation colors
- Auto Open Diagrams option
- Animation speed option
- Opening a diagram of an executing behavior

## Simulation debugging

- Understanding simulation sessions

- Debug process simulation
- Simulation console
  - Console pane
  - Simulation information
  - Simulation log file
  - Console log's filter options
  - Printing constraint failures in the console
- Runtime Value Monitoring
  - Context, runtime object, and runtime value
  - Variables pane
  - The Time series chart
  - Creating values and objects in the variables pane
  - Creating runtime objects from Classifiers
  - Creating runtime objects from Instance Specifications
  - Automatic initialization of context and runtime objects
  - Carrying values using connectors
  - Checking values against feature types
  - Exporting runtime objects to InstanceSpecifications
  - Recording Verification status of runtime values
- Updating default values
- Breakpoints
  - Adding breakpoints
  - Removing breakpoints
- Disabling updates in Simulation panes

## Validation and verification

### State Machine simulation

- Supported elements
- Adapting models for State Machine simulation
  - Defining Triggers on Transitions
  - Using Guards on Transitions
  - Behaviors on Entry, Exit, and Do Activities of a State
  - Signal properties mapping to Behavior parameters
  - State activation semantics
  - Completion Events and Transitions
  - Deferred Events
- Running a State Machine simulation
- State Machine duration simulation
- Sample projects
  - The test\_regions.mdzip sample
  - The test\_timers.mdzip sample
  - The test\_guard.mdzip sample

### Activity simulation

- Activity simulation engine
- Creating a model for Activity simulation
- Executing Activities
- Activity duration simulation
- Duration analysis
  - Duration analysis on visited elements
  - Duration analysis on executed traces
- Running a Call Action simulation without a target pin
- Activity Partition execution and allocated Behavior
- Execution of incomplete or dummy models

### Interaction simulation

- Supported elements in interaction simulation
  - Lifeline
  - Message
  - CallEvent
  - Duration constraint
  - Time constraint
  - State invariant
  - Test case verdict
  - Combined fragment
- Creating a model for interaction simulation
- Executing an interaction model
- Recording simulation as a Sequence diagram

### Use Case simulation

### Parametric evaluator

- Specifying the language for the expression

- Automatic and manual initialization of objects/values
- Value binding
  - Primitive value binding
  - Object binding
  - Binding in a complex aggregate structure
- Evaluating expressions
  - Mathematical equation
  - Logical expression
- Evaluation with causality
- Constraints on parts
- Dynamic constraint
- Parametric animation
- Manual value updates using the Parametric Evaluator
- Communicating with evaluators through simulation console
- Exchanging values between Cameo Simulation Toolkit and the Parametric Evaluator
  - Exchanging values between slot and mathematical environment
  - Exporting runtime values to Parametric Evaluator
- Built-in Math
  - Evaluating strings from command input
  - Variables
  - Values
  - Constants
  - Operators
  - Functions
- Integration with external Evaluators
  - Integration with MATLAB
  - Integration with Maple
  - Integration with Mathematica
  - Integration with OpenModelica
- Trade study with Cameo Simulation Toolkit
  - Alternative block
  - Trade study pattern block
- Monte Carlo simulation
- Sample project

## Simulation of SysML models

- FMI 2.0 co-simulation
- Supported SysML elements
  - Accept Change Structural Feature Event Action
  - Adjunct property
  - Binding Connector
  - Block
  - Association Block
  - BoundReference
  - Change Structural Feature Event
  - Classifier Behavior property
  - Constraint Block
  - Flow property
  - Full Port
  - Invocation on nested Port Action
  - Nested Connector end
  - Probability
  - Proxy Port
  - Trigger on nested Port
  - Value type
- Requirements traceability from the Variables pane
  - Requirement refined by a constraint block
  - Requirement satisfied by a property
  - Requirement and test case traceability
  - Extraction of Constraints from Text Based Requirements
- Non-normative extensions

## Action languages

- Supported scripting languages
- Reading enumeration literal value
- References to elements with HTML
- Value access and references by tags
- Importing external libraries
- ALH APIs
  - Getting a structural feature value
  - Specifying a structural feature value
  - Calling a specific Behavior
  - Calling a specific operation
  - Creating a run-time object
  - Creating a signal instance
  - Sending a signal instance to a specific target object
  - Getting a token value

- Getting the current state of a run-time object
- Getting the last signal instance from a run-time object
- Evaluating an expression
- Creating an ArrayList in Java
- Checking the State of an object
- Adding a value to an object
- Removing a value of an object
- Getting a context
- Accessing current simulation time
- Accessing the simulation time unit
- Adding a value to a global variable
- Getting a value from a global variable
- Removing a defined global variable
- Checking an existing global variable
- Checking a visited State
- Getting the caller of a script
- Getting a tag value