

Simio Processes

Process Logic and Tokens

▶ Processes

- Event Triggered / Subscribe
- Simultaneous processes
- Input Arguments/Return Values
- Suspend/Resume

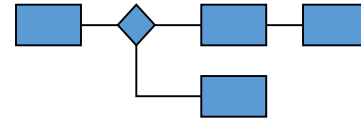
▶ Steps

- Quick tips
- Exclusion Expression
- Advanced Options

▶ Tokens

- Associated Object, Parent Object, Contextual Object
- Multiple tokens in one process
- Referencing Task Information

Processes



- ▶ A **process** is sequence of actions (e.g. assign state, delay by time, seize a resource, etc.) that may span time and change the state of the model.
- ▶ Processes are comprised of **steps** (actions) executed by **tokens** and change the state of **elements**.

Event Triggered Processes

Properties: Source1_CreatedEntity (Process Element)

Show Commonly Used Properties Only

Basic Logic

Triggering Event Name	
Triggering Event Condition	

- ▶ Triggering Event Name on Process property if 1 event triggers process



- ▶ Subscribe step allows multiple events to trigger same process
- ▶ Usually subscribe on initialization

Properties: Subscribe 1 (Subscribe Step Instance)

Show Commonly Used Properties Only

Basic Logic

Event Name	Event1
Event Condition	
Process Name	Process1
Events (More)	2 Rows

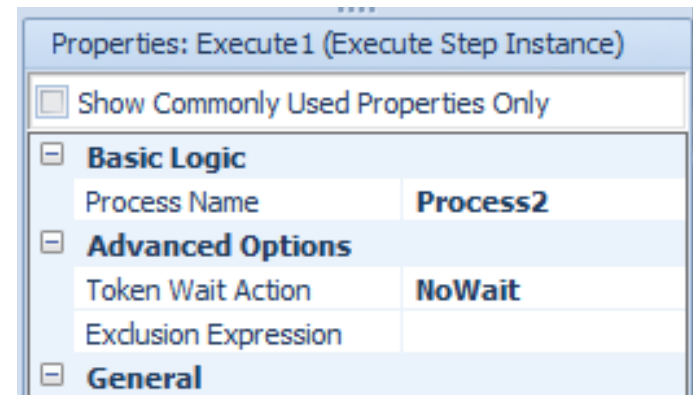
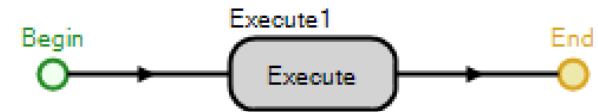
Advanced Options

General

Simultaneous Processes

- ▶ Execute step executes a process
- ▶ When **Token Wait Action** is set to NoWait, Process1 continues and Process2 starts
- ▶ Token references are copied to Process2 token
 - Token states copied if same token class

Process1



Process Options

▶ **Initially Enabled** can disable a process at Run Initialization

- This process can be enabled by the state *ProcessName.Enabled*

Initially Enabled	True	▼
Allow Step Trace	True	

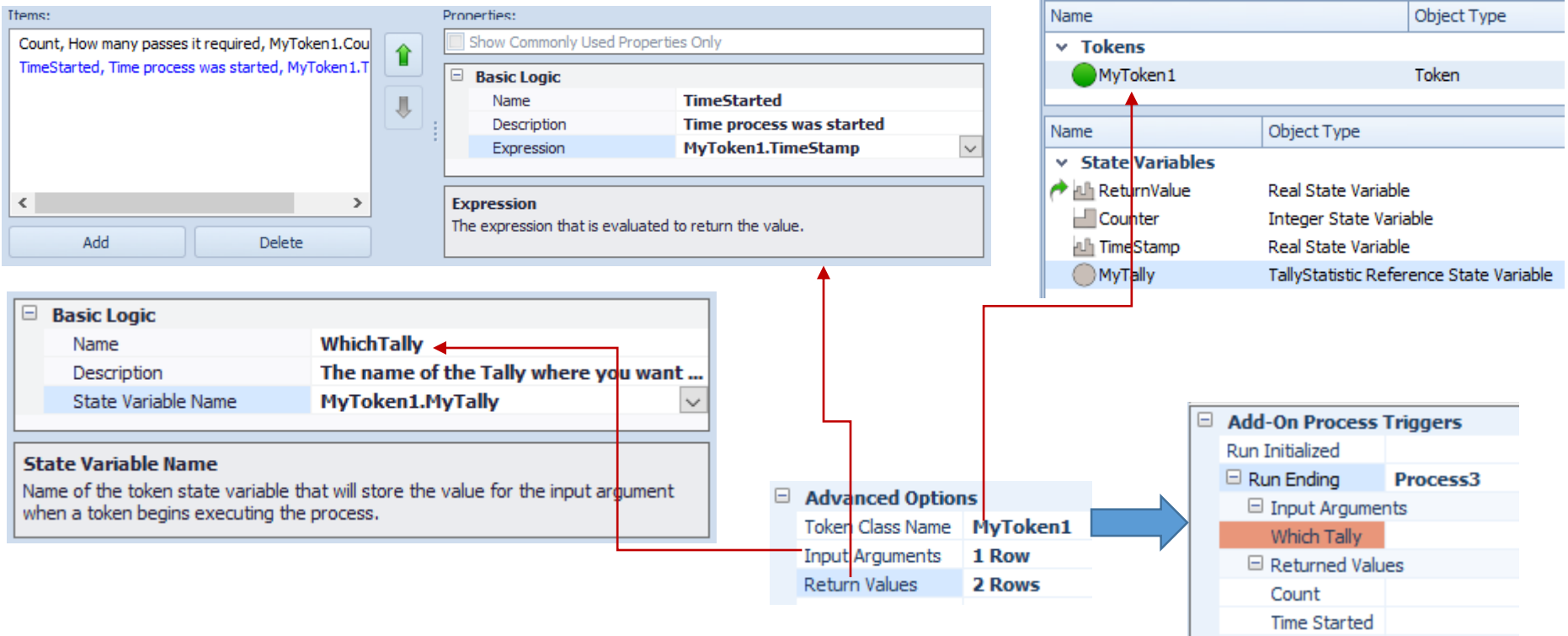
Initially Enabled
Specifies whether this process is enabled when the system is initialized. Any attempt to execute a disabled process will be ignored by the simulation engine.

▶ **Allow Step Trace** can suppress the trace messages on a process

Input Argument & Return Value

Input Arguments and Return Values facilitate sharing processes between multiple “calling” locations.

► Used along with custom tokens and states.



The screenshot displays the Simio software interface for configuring a process. It includes several panels:

- Items:** A list of items with a search bar and 'Add'/'Delete' buttons.
- Properties:** A section for configuring the process logic.
 - Basic Logic:** A table with columns for Name, Description, and Expression.

Name	Description	Expression
TimeStarted	Time process was started	MyToken1.TimeStamp
 - Expression:** A text area for the expression that is evaluated to return the value.
- Advanced Options:** A table for configuring the process options.

Token Class Name	MyToken1
Input Arguments	1 Row
Return Values	2 Rows
- State Variables:** A table listing state variables.

Name	Object Type
MyToken1	Token
ReturnValue	Real State Variable
Counter	Integer State Variable
TimeStamp	Real State Variable
MyTally	TallyStatistic Reference State Variable
- Add-On Process Triggers:** A table for configuring triggers.

Run Initialized	Process3
Input Arguments	Which Tally
Returned Values	Count
	Time Started

Red arrows indicate the flow of information: from the 'Advanced Options' table to the 'Basic Logic' table, from the 'State Variables' table to the 'Basic Logic' table, and from the 'Add-On Process Triggers' table to the 'Basic Logic' table. A blue arrow points from the 'Advanced Options' table to the 'Add-On Process Triggers' table.

Suspend and Resume

▶ Suspend and Resume Processes



Properties: Suspend1 (Suspend Step Instance)

Basic Logic	
Suspend Type	Process
Process Name	BeforeProcessing
Token Match Condition	Candidate.CreateOrderToken.RowNumber == 3 ▼
Suspend Actions (More)	0 Rows
Advanced Options	
General	

Token Match Condition
Optional match condition used to filter the tokens executing the process. Only tokens currently in process that satisfy this condition will be suspended.

In the expression, use the syntax `Candidate.[TokenClass].[Attribute]` or `Candidate.[TokenAssociatedObjectClass].[Attribute]` to reference an attribute of either the candidate process tokens themselves or the objects associated with those process tokens (e.g., `Candidate.Token.TimeInProcess` or `Candidate.Entity.TimeInSystem`).

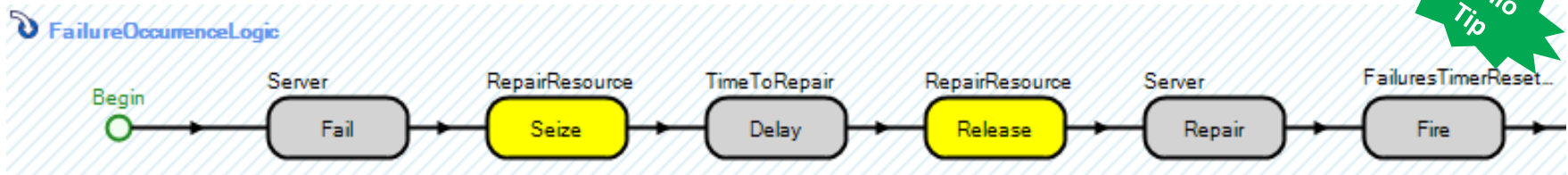
Quick Tips

- ▶ Zoom selected process with +/- keys or ctrl+scroll
- ▶ Copy and Paste multiple processes
- ▶ Select multiple processes by holding Ctrl
- ▶ Select group of processes with Shift
- ▶ Assign a process *Category* which you can then expand/collapse.
- ▶ Filter (search bar at top): Processes and Categories
- ▶ Add Description to Processes and/or Steps



Steps

- ▶ Use of **Name** (F2 key) is very important for model clarity, documentation, trace, and debugging.
- ▶ **Color** coding steps particularly in large or overridden process can add clarity.

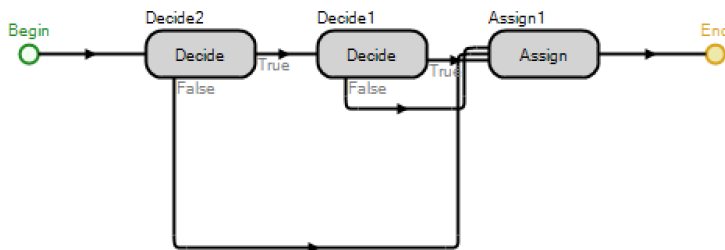









- ▶ Add steps to Common steps
- ▶ Copy & Paste step
- ▶ Hover over steps to see non default values (change 0.0 to 0)

Steps

- ▶ **Exclusion Expression** is evaluated at the start of run to determine if step is skipped
- ▶ Steps can be modified in Property Spreadsheet
- ▶ Disconnect Exit/Alt Exit disconnects the step's exit when multiple steps exit into same step

Process1

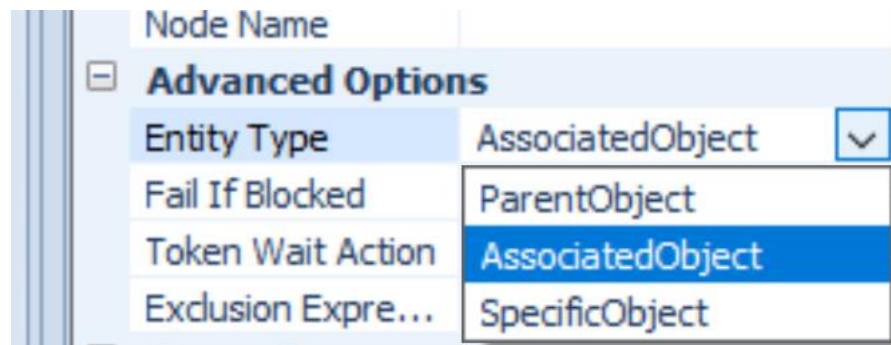


	Copy
	Cut
	Paste
	Rename
	Breakpoint
	Disconnect Alternate Exit
	Delete Step
Open process spreadsheet view for all items of this type	

Steps – Advanced Options

▶ Object Type/Owner Type – apply step to different object

- Associate Object (default)
- Specific Object
- Parent Object

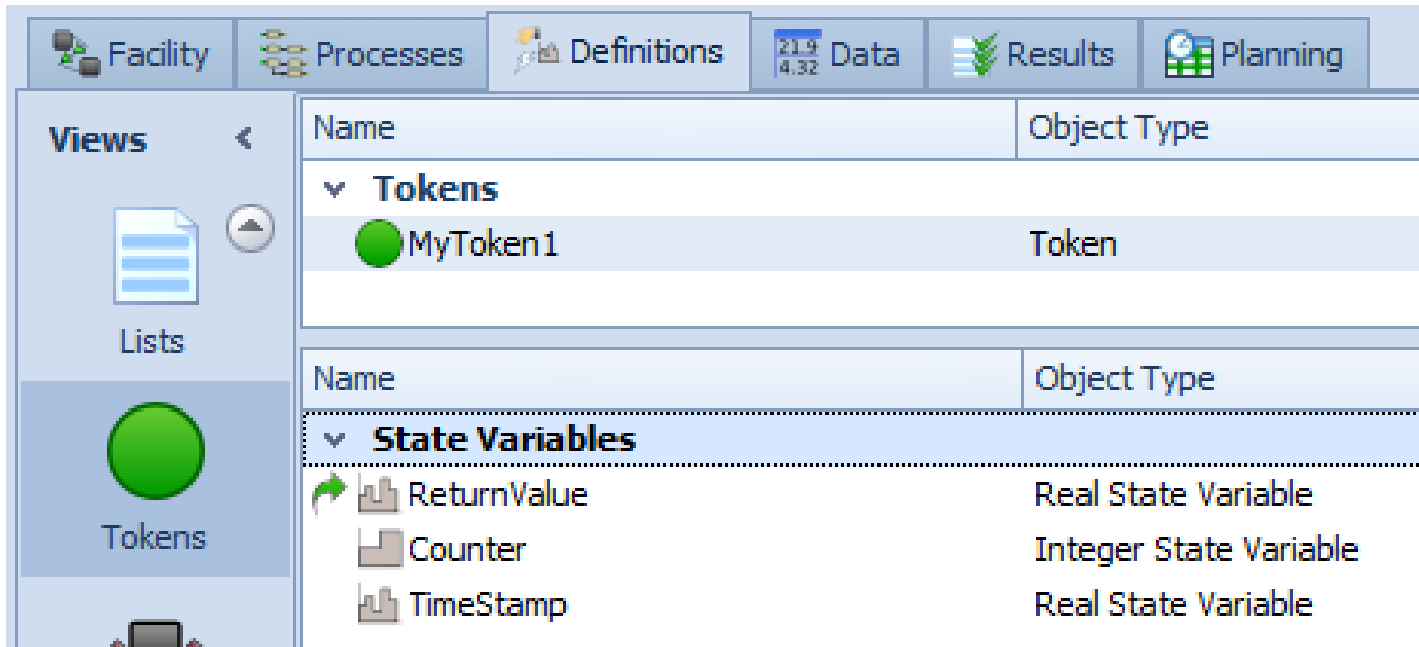


Examples:

Transfer, Travel, Unpark

Tokens

- ▶ Tokens move from step to step in a process.
- ▶ Tokens are “delegates” from entities or other objects to execute processes.
- ▶ Custom Tokens may carry user-defined states that change at a step.



The screenshot shows the Simio software interface with the following components:

- Navigation Bar:** Facility, Processes, Definitions, Data (21.9, 4.32), Results, Planning.
- Views Panel:** Lists, Tokens (selected), and a partially visible bottom icon.
- Tokens Table:**

Name	Object Type
▼ Tokens	
● MyToken1	Token
- State Variables Table:**

Name	Object Type
▼ State Variables	
↻ Return Value	Real State Variable
Counter	Integer State Variable
TimeStamp	Real State Variable

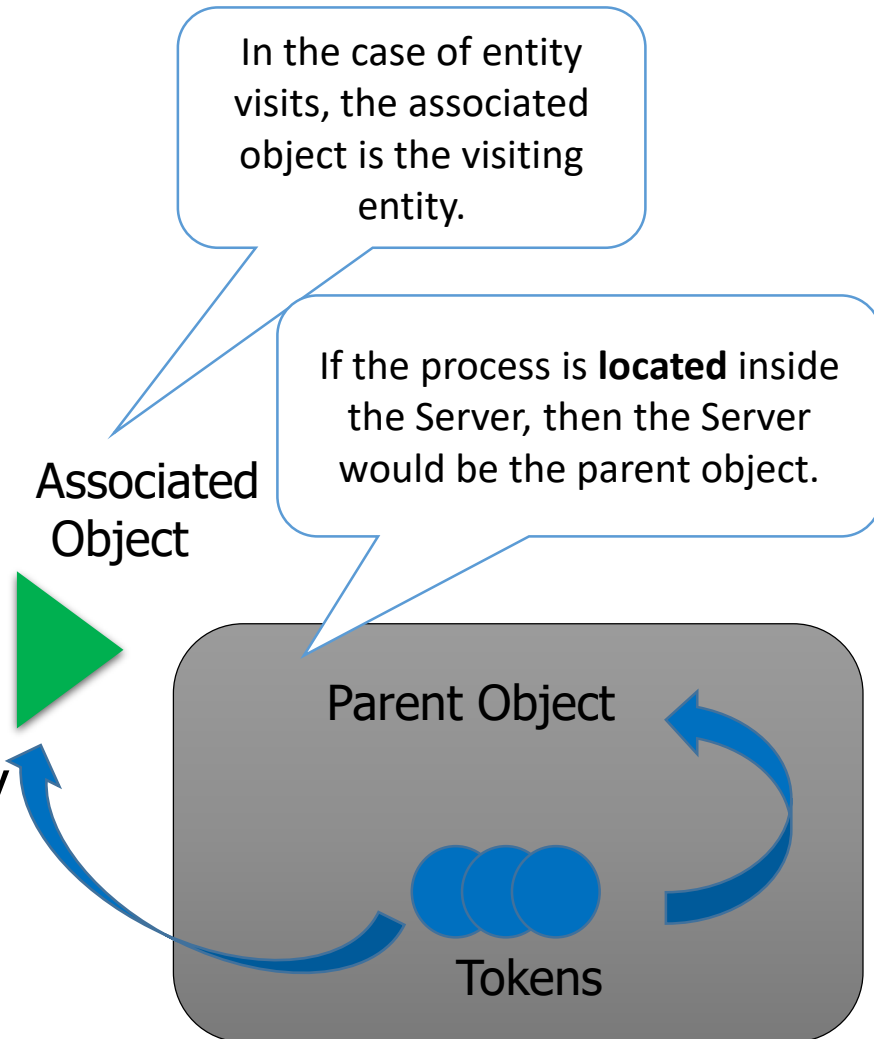
Token.ReturnValue

- ▶ Special-purpose numeric state value
- ▶ **Decision Process** – use this state variable to return a True or False for the evaluation
- ▶ **Search** – returns the sum of an expression evaluated across the search collection
 - Tip - Set the Search Expression to '1' to return the number of items found

Simio
Tip

Token Data Referencing

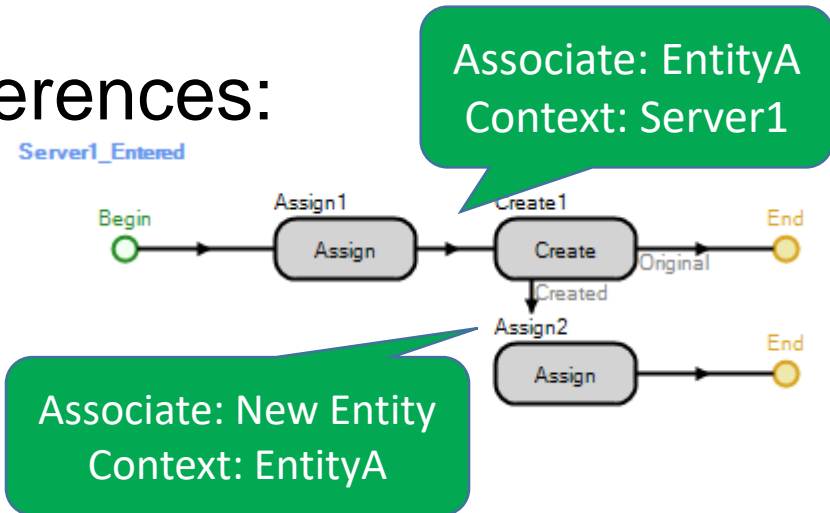
- ▶ A token carries a reference to both its **parent object** and **associated object**.
- ▶ The attributes of the associated object may be referenced using the class name; e.g. *ModelEntity.TimeCreated*
- ▶ The attributes of the parent object may be referenced by name; e.g. *ProcessTime*



Associated vs Context Objects

▶ Tokens have 2 internal references:

- Token.AssociatedObject
- Token.ContextObject



▶ Add-on Process

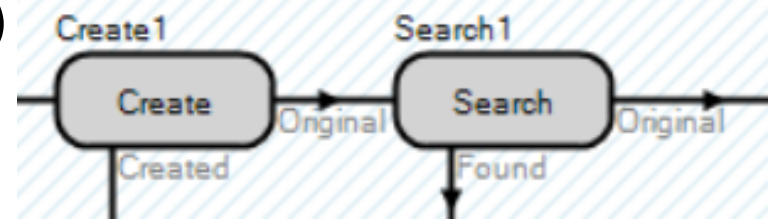
- Associated Object - Object triggering the process
- Context Object – secondary object reference, usually object on which add-on process applied

▶ Search or Create steps

- Associated Object – Object Found or Create
- Context Object – Object associated with the **original token** that triggered the Search/Create step

Multiple Tokens in One Process

- ▶ Multiple tokens can be active in a single process
- ▶ Some steps allow multiple exits
 - Create, Search, Interrupt, Remove, UnBatch
 - Each “extra” token may have a different associated object or table row
 - All tokens will exit the bottom branch and proceed until a delay type step first, then the original token continues (opposite for Interrupt step)



- ▶ Tokens for multiple objects can be active on the same process

MyServer1		
>	OnEnteredInputBuffer	4 Tokens In Process
>	OnRenegedFromInputBuffer	0 Tokens In Process
>	OnEnteredProcessing	1 Tokens In Process

Multiple Tokens in One Process

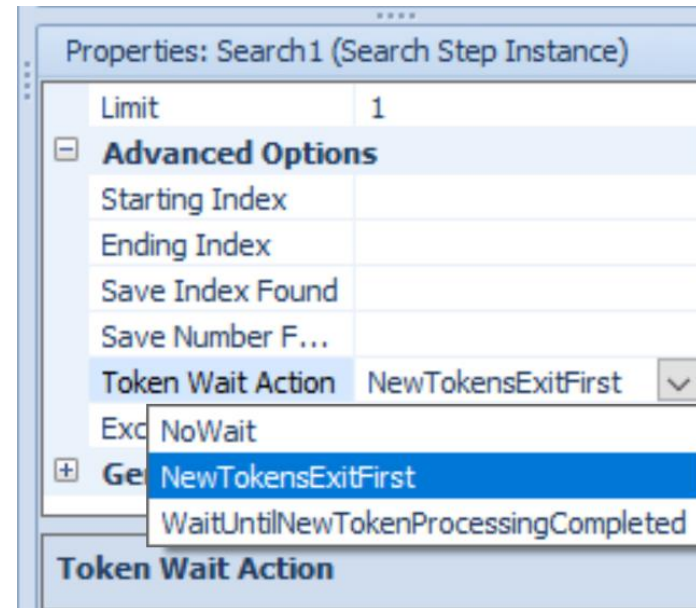
- ▶ New property on the Search Step, Create Step, Remove Step, Unbatch Step

Token Wait Action

NoWait

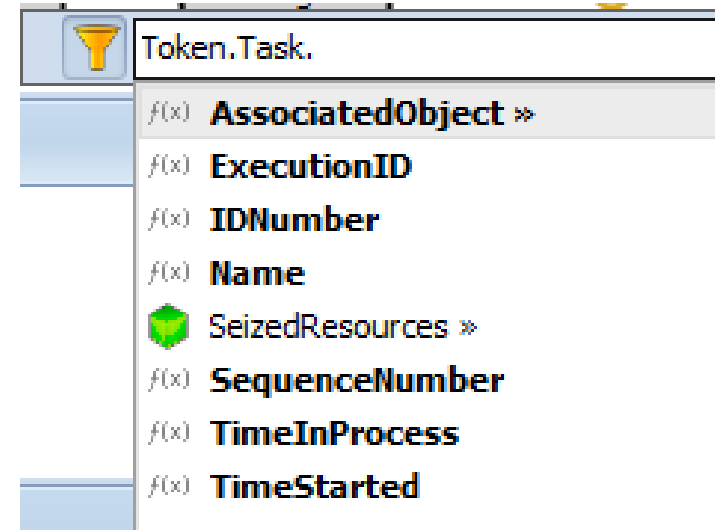
NewTokensExitFirst

WaitUntilNewTokenProcessingCompleted



Token.Task

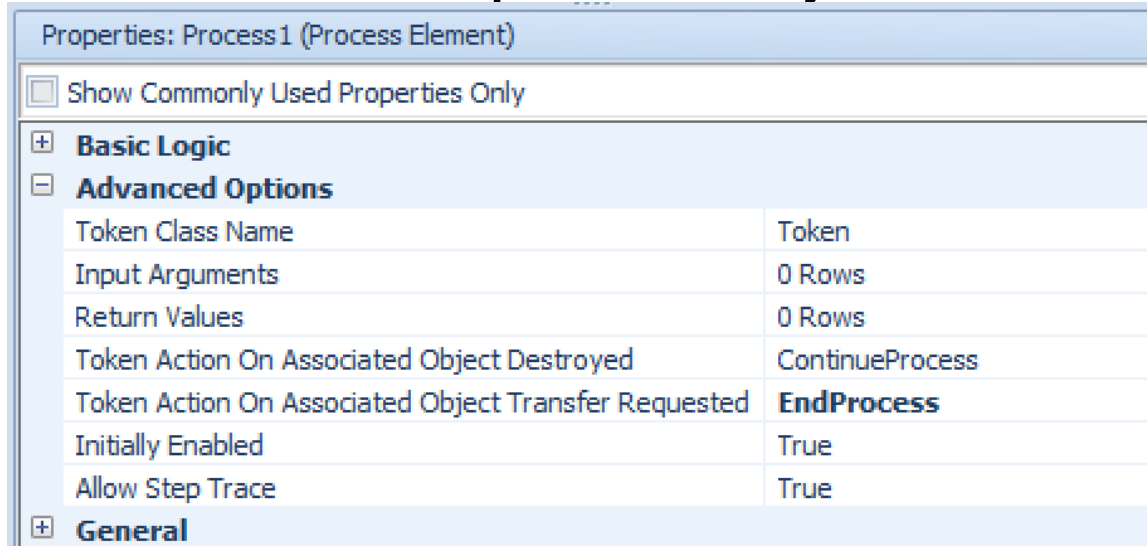
- ▶ **Execution ID** – id automatically assigned when task starts
- ▶ **ID Number** – Task ID for immediate predecessor or successor
- ▶ **Seized Resources** – resources seized by task's execution
- ▶ **Sequence Number** – string representing sequence number for task's precedence



Token Action properties

Token Actions relate to changes in associated object.

- ▶ What happens when token's associated object is destroyed?
- ▶ What happens when token's associated object is transferred out of the parent object?



Properties: Process 1 (Process Element)

Show Commonly Used Properties Only

+ Basic Logic	
- Advanced Options	
Token Class Name	Token
Input Arguments	0 Rows
Return Values	0 Rows
Token Action On Associated Object Destroyed	ContinueProcess
Token Action On Associated Object Transfer Requested	EndProcess
Initially Enabled	True
Allow Step Trace	True
+ General	