

TRUE

TEMPORAL REASONING UNIVERSAL ELABORATION

True System dynamics software

MANUAL Part 06

Vectorization

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www.true-world.com

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I - VECTORS

A stock or a flow can be vectorized by a vector that contains domains.
While computing, vectorized elements will be duplicated for all the domains of the vector.

The duplicated stocks may or not have their own initial value.
The actions of the duplicated flows may or not have their own parameters.

The combined vectors are obtained by making the cartesian product of the domains of two or more vectors, the maximum is up to 20 vectors.

A) Vector

1. Create a vector

There are several possibilities for creating a vector :

- Select the 'Vectors' option from the 'Windows' main menu to open the 'Vectors' window
- Select the elements from the model or from the 'Elements' window
- Select the 'Assign a vector' option from the context menu or click on the 'Assign a vector' button from the toolbar
- Display the 'Vectors' window or select an element (stock or flow) from the 'Elements' window
- Click on the 'Ve' interrupt
- Display the 'Vectors' window

In the 'Vectors' window

- Press the 'Insert' key from the table of vectors or select the 'New vector' option from the context menu
- Enter the name of the vector

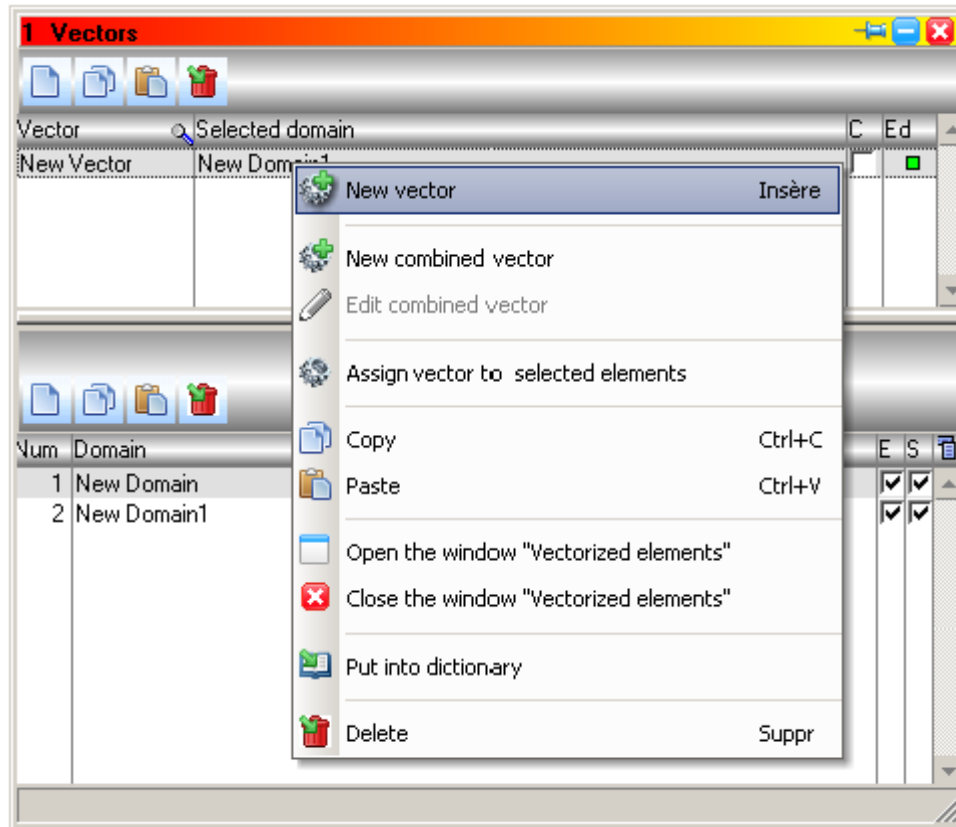
2. Modifying the name of the vector

- Select a vector
- Press the 'F2' key or double-click on the vector
- Modify the name

3. Allocating a vector to the selected elements

- Select the elements from the model
- Select a vector from the table of vectors
- Select the 'Allocate vector to selected elements' option

'Vectors' window



Columns in the table of vectors

- ❑ 'C' : type of vector : normal or combined, if this interrupt is ticked
- ❑ 'Ed' : click on green led to open the 'Vectorized elements' window

Columns in the table of domains

- ❑ 'E' : enables the domain if this box is ticked
- ❑ 'S' : selected domain for charts and exporting data : the duplicated elements corresponding to the selected domains will be displayed in the news charts and in the 'Export' window

Options in the context menu

- ❑ 'Copy/Paste' option : duplicates the selected vector
- ❑ 'Open/Close the window 'Vectorized elements' option : open or close this window
- ❑ 'Put into dictionary' option : memorizes the vector and its domains in the dictionary
- Note : if the pin is enable, the selection of one vectorized element in the model doesn't select the vector in the window of vectors
- The domain selected from the table of domains affects the way the vectorized elements in the model are displayed and the selection of the actions in the 'Flows' able.
To display the default actions (before vectorization) in the 'Flow' table, disable the domain in the table of domains in the 'Vectors' window.

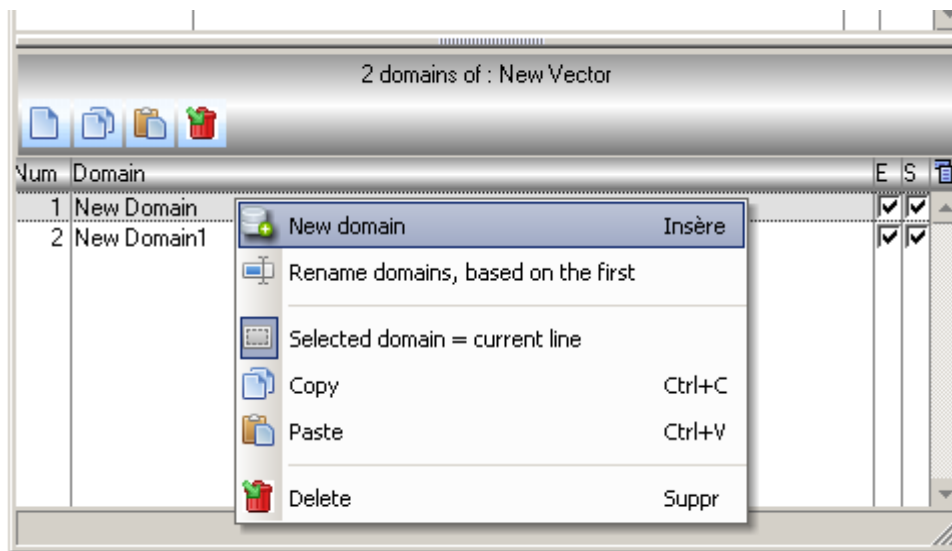
B) Domain

1. Creating a domain

In the 'Vectors' window :

- ❑ Select the vector from the table of vectors
- ❑ Select the table of domains
- ❑ Press the 'Insert' key or click on the 'New domain' button or select the 'New domain' option from the context menu
- ❑ Enter the name of the domain

Table of domains



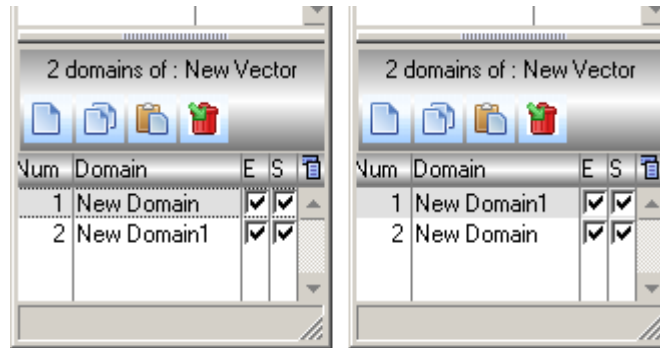
2. Modifying the name of a domain

- ❑ Select the domain
 - ❑ Press the 'F2' key or double-click on the domain
 - ❑ Modify the name
- Note : the modified name of the domain will appear all over the model (actions, charts).

3. Ordering a domain

- Drag-and-drop one or more domains, up or down

'New Domain' domain : before and after ordering



- Note : ordering a domain doesn't affect the values of the vectorized elements, because they correspond to the number of order of the domain and not to its name

❖ Example :

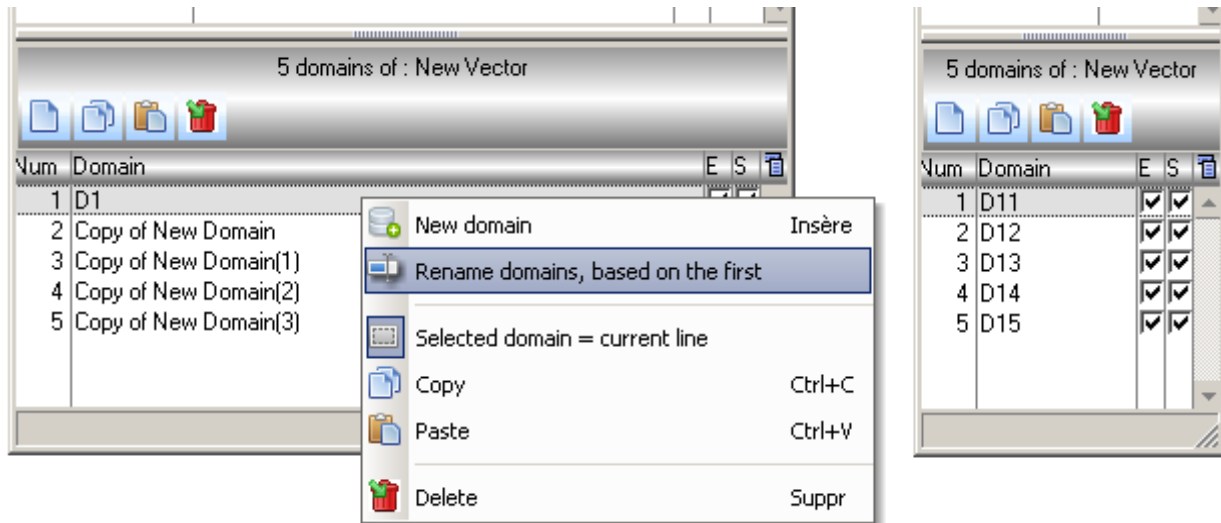
- stock 'a' and the following domains
 - V2 : 2 domains
 - V3 : 3 domains
 - V5 : 5 domains
 - V10 : 10 domains
 - the domains are D1 to D10
- V3 is assigned to the stock 'a' : the initial values for the domains 1,2,3 are 10, 20, 30
- V5 is assigned to the stock 'a' : the initial values for the domains 1,2,3 are always 10, 20, 30
- the initial values for the domains 4,5 are now 40, 50
- V2 is assigned to stock 'a' : the initial values for the domains 1,2 are always 10, 20
- the vector V2 is disabled
- V10 is assigned to stock 'a' : the initial values for the domains 1,2,3,4,5 are 10,20,30,40,50
- the first three domains are ordered as : D3, D1, D2
- the initial values are not assigned : for the domains 1,2,3,4,5, they are 10, 20, 30, 40, 50

The same principle applies also for the actions of the vectorized flows.

4. Renaming the domains

- ❑ Rename the first domain : remove the numbers at the end of name
- ❑ Select the 'Rename domain domains, based on the first' option

Numbering of the domains from the first, before, after



C) Combined vector

A combined vector :

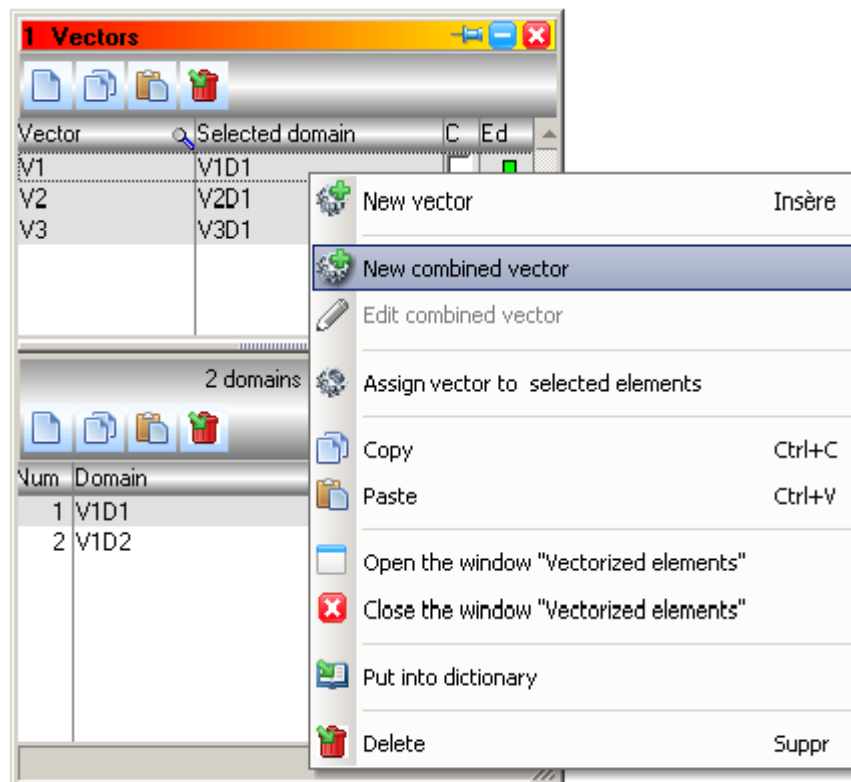
- ❑ It is created by using the cartesian product from the vectors's domains
- ❑ It can combine up to twenty vectors
- ❑ It can not be duplicated
- ❑ Two combined vectors cannot have the same combination of vectors
- ❑ The number of its domains is equal to the product of the domains of its vectors
- ❑ Its domains cannot be renamed
- ❑ Modifying the name of a source domain, will also modify the name of its domains
- ❑ Ordering a source domain modifies the name of its domains

1. Creating a combined vector

In the 'Vectors' window :

- ❑ Select the source vectors in the table of the vectors
- ❑ Select the 'New combined vector' option

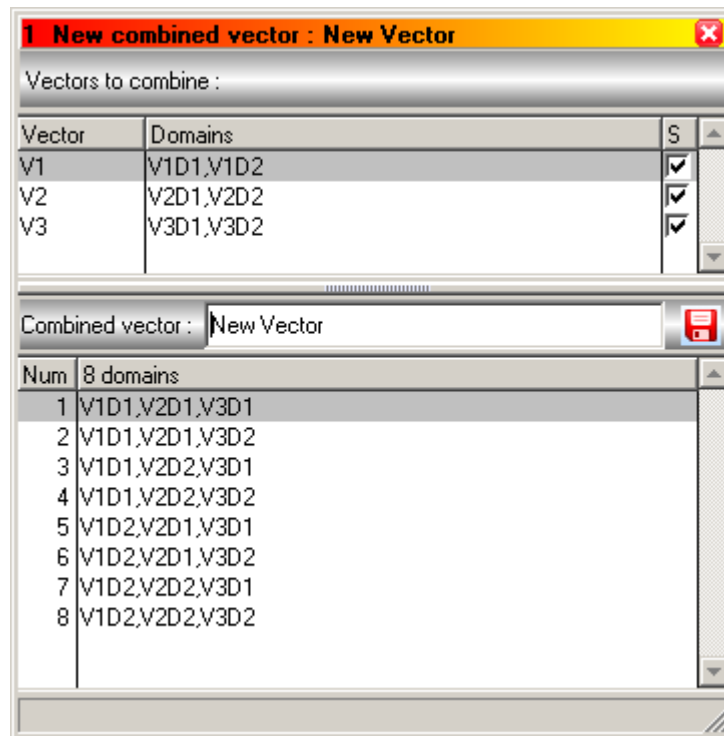
Selection of the source vectors and context menu



In the table 'Vectors to combine' from the 'New combined vector' window :

- ❑ Check the box corresponding to the 'S' column on the line with the vectors to be combined
- ❑ Drag-and-drop the vectors to the top or the bottom to order the combination, if necessary
- ❑ Enter the name of the new combined vector in the 'Combined vector' field
- ❑ Save

'New combined vector' window



2. Modifying a combined vector

In the table of the vectors of the 'Vectors' window :

- ❑ Select the combined vector you wish to modify
- ❑ Select other possible vectors to add in the combined vector
- ❑ Select the 'Update combined vector' option

In the 'Vectors to combine' table :

- ❑ Follow the steps used for creating a combined vector

D) Displaying of the vectorized elements

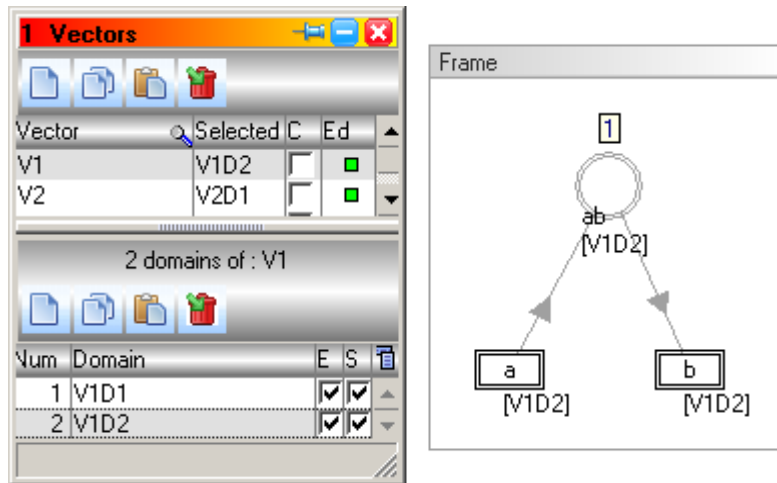
1. Elements vectorized by a vector

The base of a vectorized stock contains two rectangles.

A vectorized flow has two circles.

The name of the domain selected in the table of the domains is displayed under the name of the element in the model.

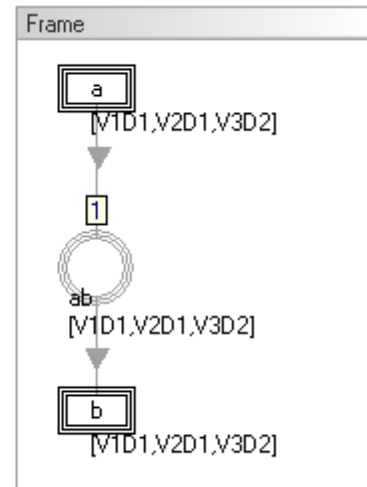
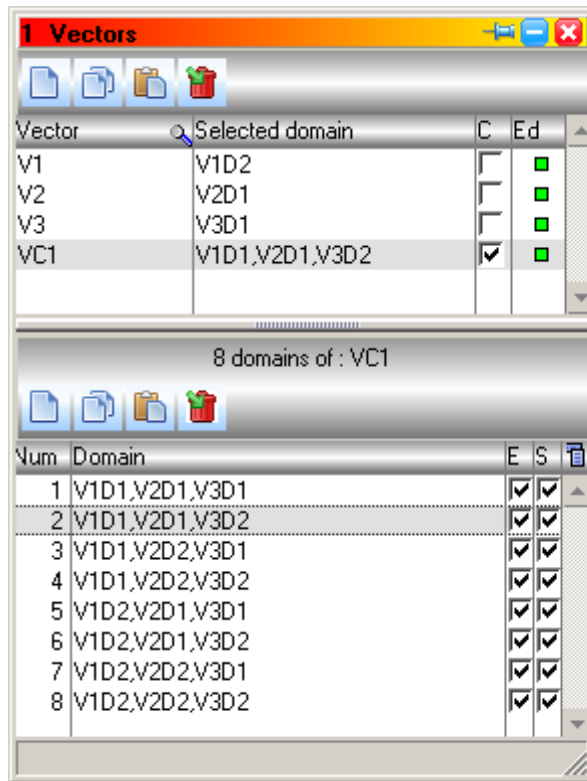
Selection of the 'V1D2' domain



2. Elements vectorized by a combined vector

The base of a stock vectorized by a combined vector has tree rectangles.
The flow vectorized by a combined vector has tree circles.

Selection of the 'V1D1,V2D1,V3D2' domain



3. Cartesian flow

A flow is a cartesian one when it is vectorized by a combined vector:

Cartesian flow type 1

- ❑ It connects a vectorized stock by the combined vector and another vectorized stock by one of the source vectors of the combined vector
- ❑ It is represented by tree circles and one square

Cartesian flow type 2

- ❑ The combined vector combines two source vectors; the flow connects a vectorized stock by one of the first source vector and another vectorized stock by the second source vector
- ❑ It is represented by tree circles and two squares

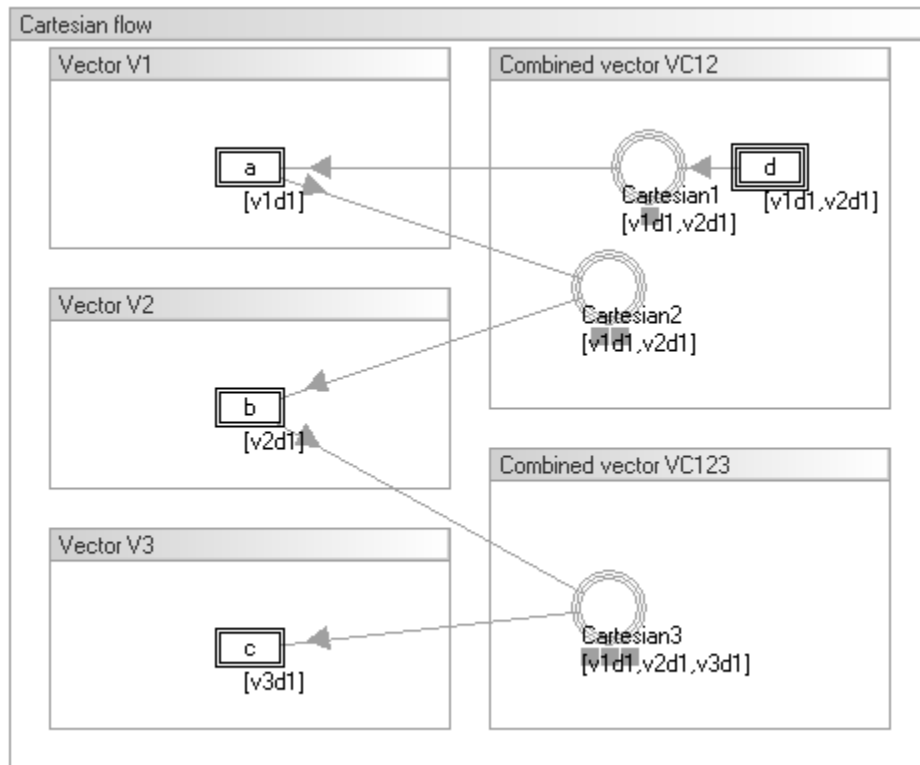
Cartesian flow type 3

- ❑ The combined vector combines tree source vectors; the flow connects a vectorized stock by one of the source vectors and another vectorized stock by another source vector
- ❑ It is represented by tree circles and tree squares
- ❑ This flow will be disabled when computing, because the domains are not in phase

❖ Example

- the combined vector VC12 combines the vectors V1 et V2
- the combined vector VC123 combines the vectors V1, V2 et V3
- the 'Cartesian 1' flow connects one stock of the vector V1 and one stock of the vector VC12
- the 'Cartesian 2' flow connects one stock of the vector V1 and one stock of the vector V2
- the 'Cartesian 3' flow connects one stock of the vector V2 and one stock of the vector V3

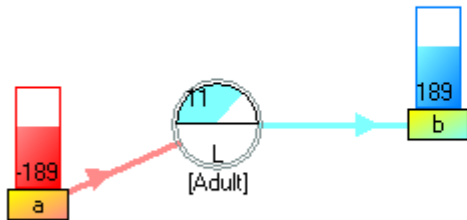
Cartesian flows type 1, 2 and 3



4. Equivalences

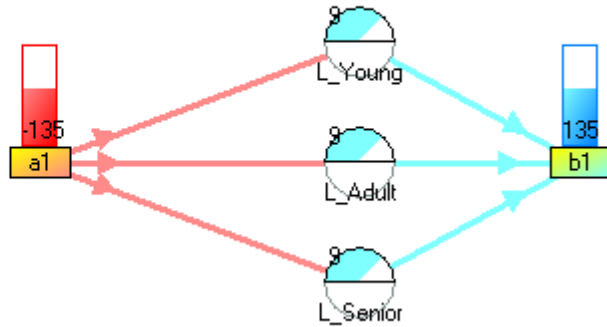
Case 1 : normal vector

2 not vectorized stocks
1 vectorized flow



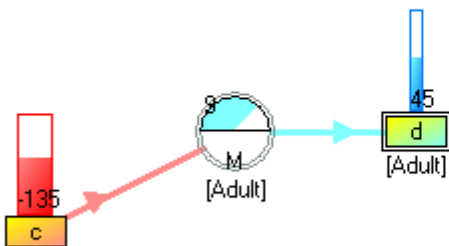
Equivalent 1

the vector has 3 domains



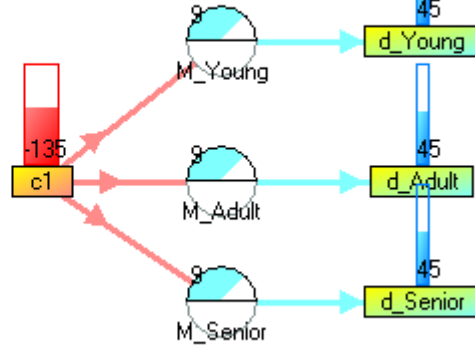
Case 2 : normal vector

1 not vectorized stock
1 vectorized flow and one vectorized stock



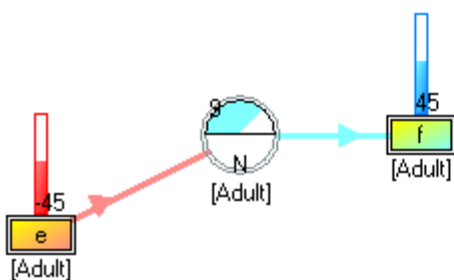
Equivalent 2

the vector has 3 domains



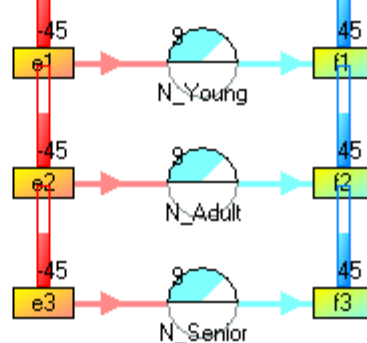
Case 3 : normal vectors

1 flow and 2 stocks vectorized by a same vector
or by 2 or 3 vectors with the same number of domains



Equivalent 3

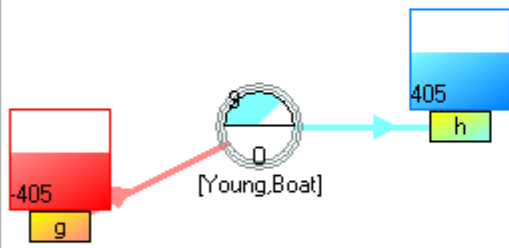
the vector has 3 domains



Case 4 : combined vector

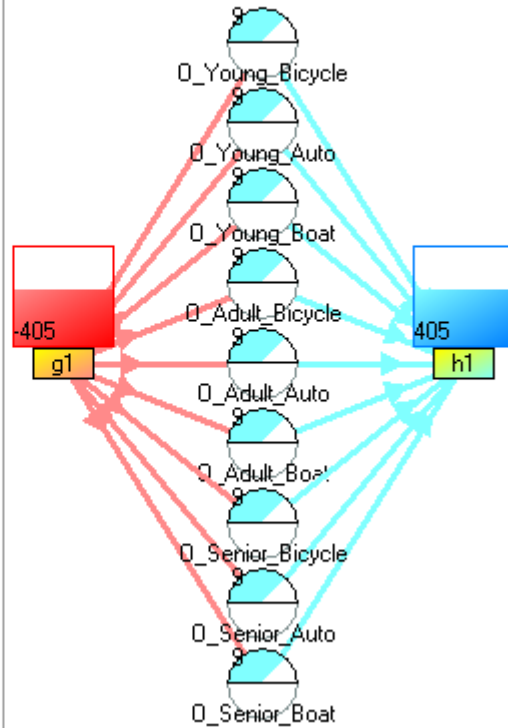
2 not vectorized stocks

1 flow vectorized by a combined vector



Equivalent 4

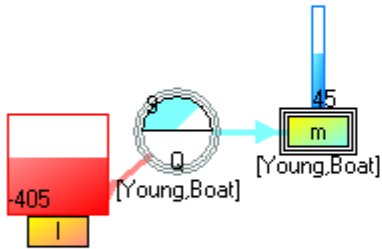
the combined vector has 9 domains



Case 5 : combined vector

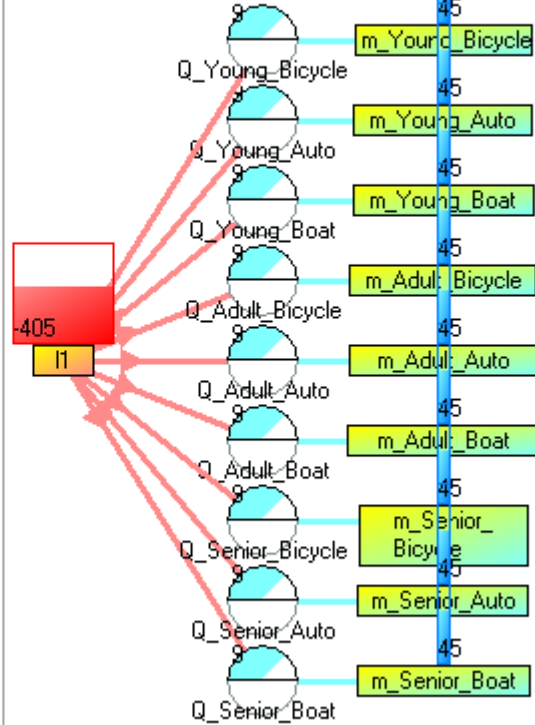
1 not vectorized stock

1 flow and 1 stock vectorized by one combined vector



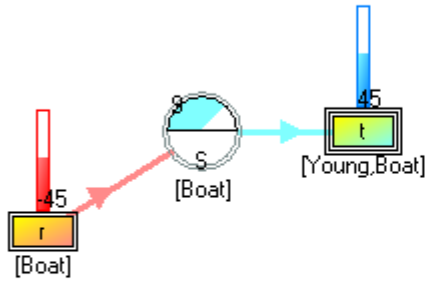
Equivalent 5

the combined vector has 9 domains



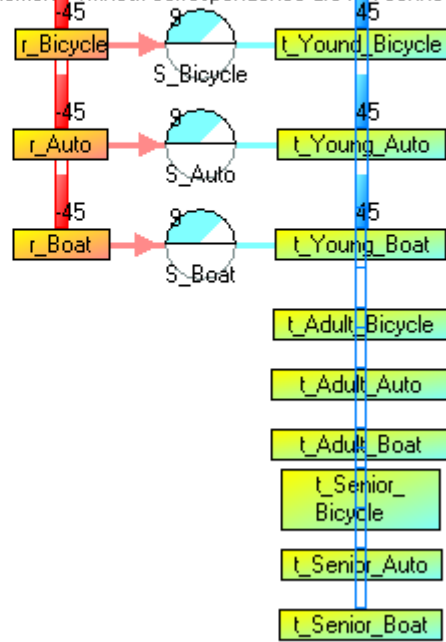
Case 6 : normal and combined vector

1 stock and 1 flow vectorized by a normal vector
 1 stock vectorized by a combined vector



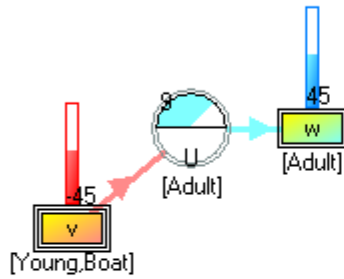
Equivalent 6

the vector has 3 domains
 connected to the 3 first of the 9 domains of the combined vector
 there is a correspondence between the numbers of domains but not
 between the domain names,
 the elements without correspondence are not connected



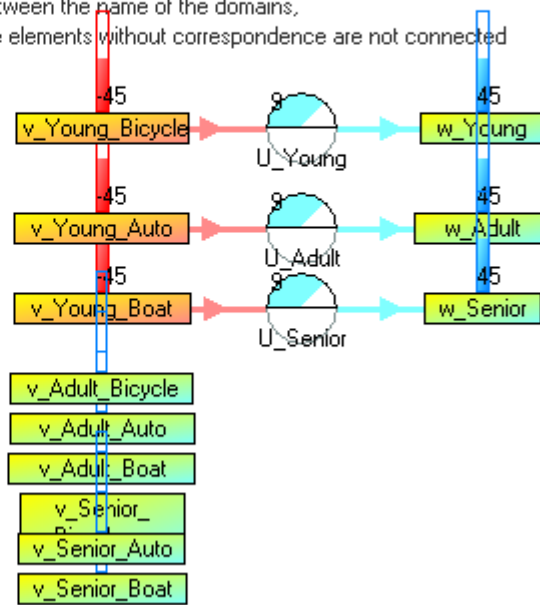
Case 7 : normal and combined vector

- 1 stock vectorized by a combined vector
- 1 flow and 1 stock vectorized by a normal vector



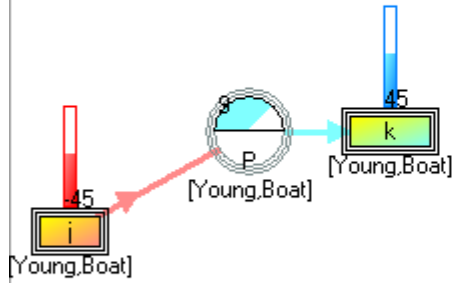
Equivalent 7

the combined vector has 9 domains
 the 3 first are connected to the 3 domains of the normal vector
 there is a correspondence between the numbers of domains but not
 between the name of the domains,
 the elements without correspondence are not connected



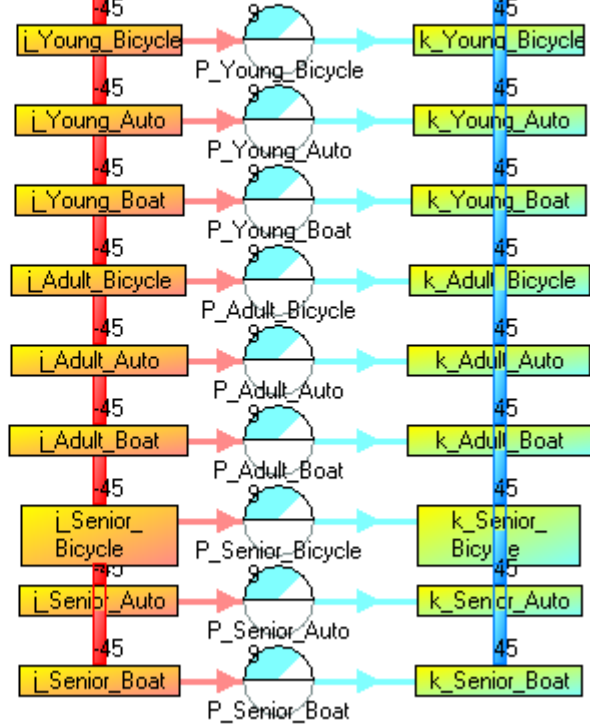
Case 8 : combined vectors

2 stocks and 1 flow vectorized by 1,2 or 3 combined vectors having the same number of domains



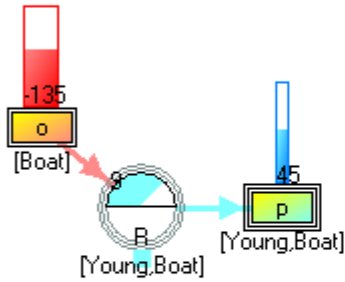
Equivalent 8

the combined vector has 9 domains



Case 9 : normal and combined vectors

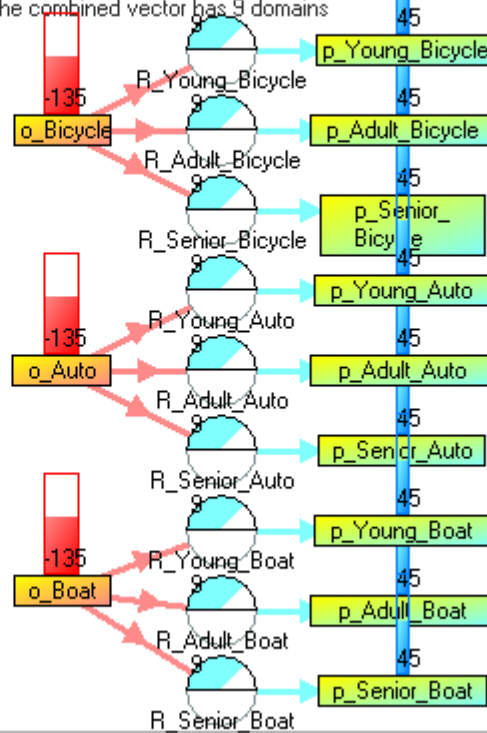
1 stock vectorized by a normal vector
 1 flow and 1 stock vectorized by a combined vector



A square below the flow indicates that one of the source vectors is connected to the combined vector

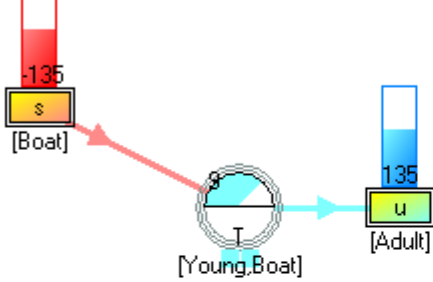
Equivalent 9

the normal vector has 3 domains
 the combined vector has 9 domains



Case 10 : normal and combined vectors

1 stock vectorized by a normal vector V1
 1 stock vectorized by a normal vector V2
 1 flow vectorized by a vector combining the vectors V1 and V2



Two squares above the flow indicate that the two source vectors are connected to the vector combined

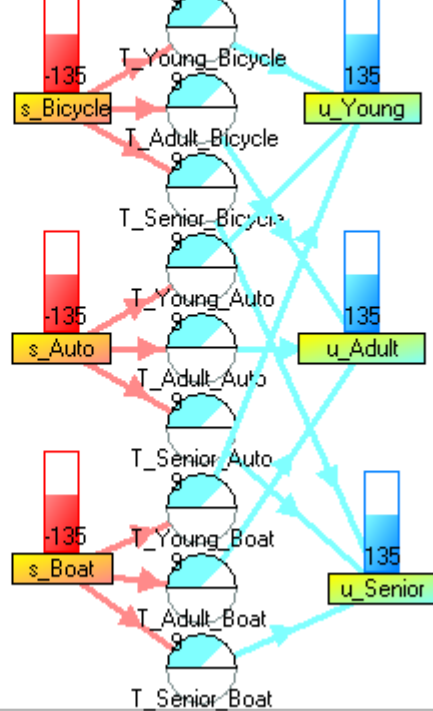
Note:

If a combined vector combines more than two source vectors:

- It can not be connected to two of its source vectors
- 3 squares are above the flow
- the flow will be disabled when computing

Equivalent 10

the normal vectors have each 3 domains
 the combined vector has 9 domains

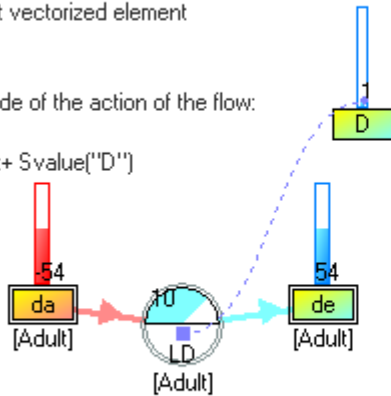


Case 11 : dependence not vectorized

2 vectorized stocks and 1 vectorized flow
the vectorized flow is dependent of one not vectorized element

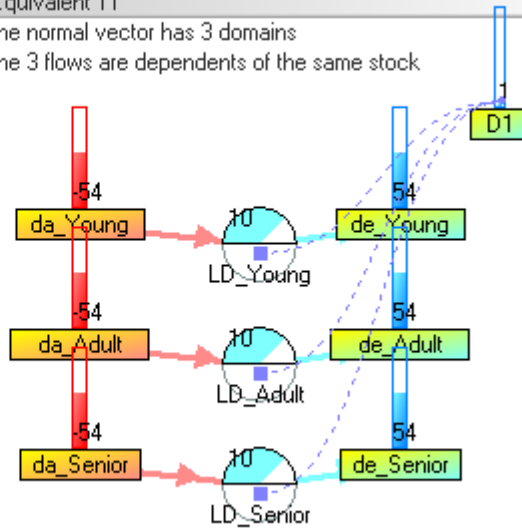
Code of the action of the flow:

$y = t + Svalue("D")$



Equivalent 11

the normal vector has 3 domains
the 3 flows are dependents of the same stock



Case 12 : dependence vectorized

2 stocks and 1 vectorized flow
the flow is dependent of one vectorized element

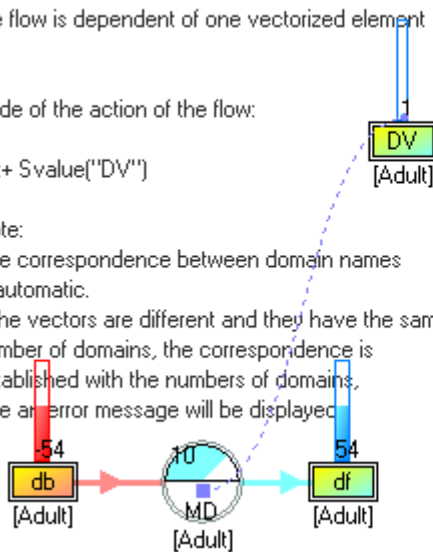
Code of the action of the flow:

$y = t + Svalue("DV")$

Note:

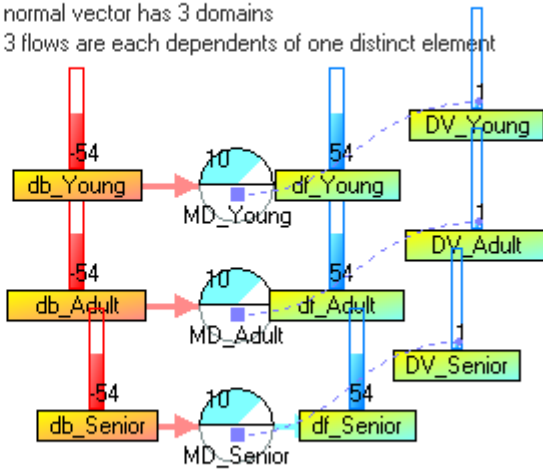
The correspondence between domain names is automatic.

If the vectors are different and they have the same number of domains, the correspondence is established with the numbers of domains, else an error message will be displayed



Equivalent 12

the normal vector has 3 domains
the 3 flows are each dependents of one distinct element



Case 13: dependence of one vector

2 stocks and 1 vectorized flow

1 other vectorized flow is dependent of the vectorized flow

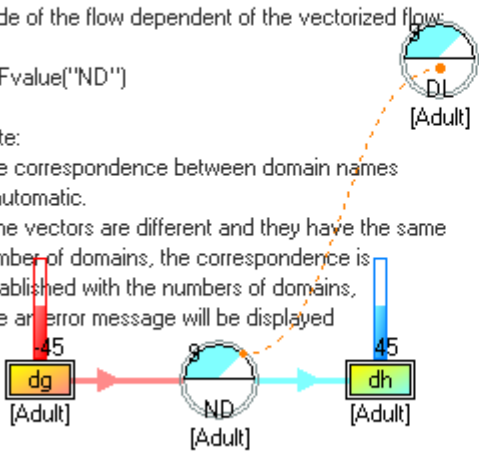
Code of the flow dependent of the vectorized flow:

`y = Fvalue("ND")`

Note:

The correspondence between domain names is automatic.

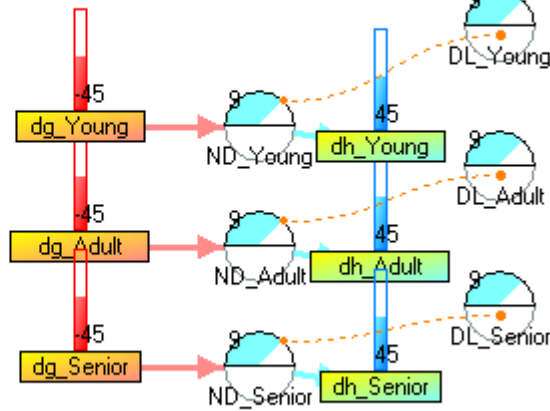
If the vectors are different and they have the same number of domains, the correspondence is established with the numbers of domains, else an error message will be displayed



Equivalent 13

the normal vector has 3 domains

the 3 flows are each dependent of one distinct element



Case 14 Cartesian virtual flow

- 1 stock vectorized by a vector 1
- 1 stock vectorized by a vector 2
- 1 virtual flow vectorized by a combined vector combining the vectors v1 and v2

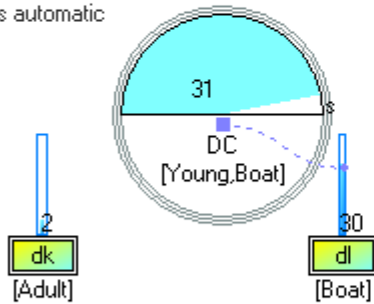
In the virtual flow, an action refers to the tow stocks, without specifying the names of the domains:

Code of the action:

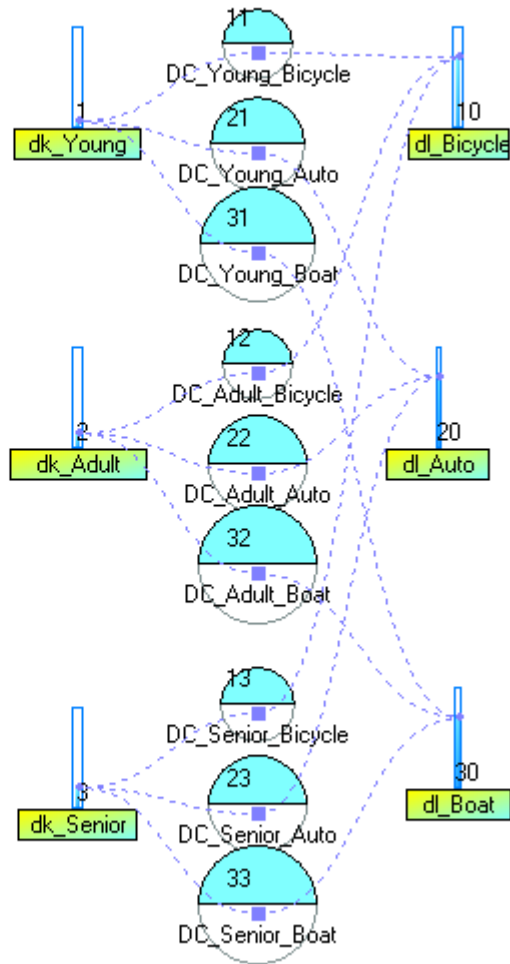
```
y= Svalue("dk")+ Svalue("dl")
```

Note:

the correspondence between domain names is automatic



Equivalent 14



II - VECTORIZATION

A) stocks

When a stock is vectorized it is duplicated by all domains of its vector.
The initial values of the stocks will be, by default, those of the stock before the vectorization.

1. Initial values by domains

Initializing the initial values by domains for duplicated stocks

Open the 'Vectors' window :

- Select the 'Vector' option of the 'Windows' main menu
- Select the vectorized stock from the model or from the 'Elements' window :
- The corresponding vector will be selected in the 'Vectors' window
or

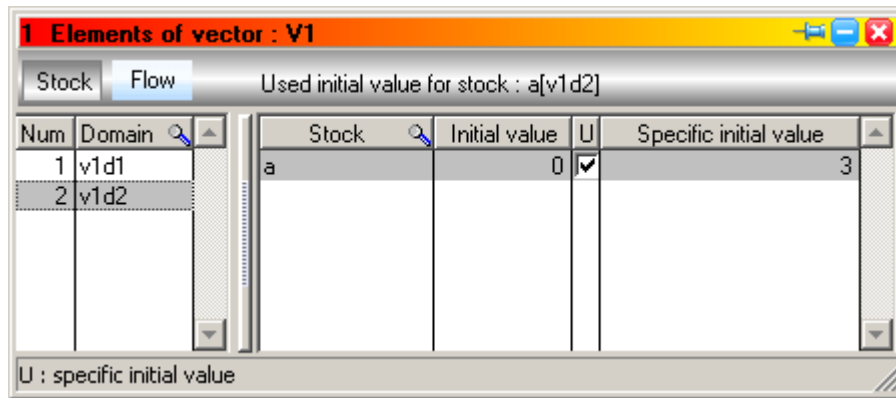
In the 'Vectors' window :

- Select the vector
- Click on the green led 'Ed'
or
- Select the 'Open the window Vectorized elements' option from the context menu of the table of vectors

In the 'Elements of vector' window :

- Click on the 'Stock' button to view the plan of the stocks
- Select the domain and the stock you wish to initialize
- Enter the initial value
- Tick the box 'U' to activate the initial specific value for this domain

Initial specific value for the 'a' stock



Before the vectorization, the initial value of the 'a' stock was 2.

After the vectorization and ticking the box 'U', the initial value of the 'a' stock for the domain 'V1D2' became 3.

- Notes : if the pin is disabled, than :
 - the selection of a vectorized stock from the model or from the 'Elements' window, selects the stock from the 'Elements of vector' window.
 - the selection of a domain from the 'Vector' window selects the domain from the 'Elements of vector' window
- Note : the selection of a stock from this window selects the stock from the model and from the 'Elements' window
- Tip - to reset the initial value of all the duplicated stocks :
 - Select the 'Vector disable' option from the context menu of the selected stocks in the model,
 - Modify the initial value,
 - Enable the vector with the 'Vector enable' option from the context menu or use the 'Vector' buttons from the left toolbar

B) Flows

When a flow is vectorized, it is duplicated for all the domains of the vector.
The actions of the duplicated flows will be, by default, the same as the actions of the flow before vectorization.

1. Actions by domain

Initializing the actions for each domain for the duplicated flows

Open the 'Vectors' window

- Select the 'Vector' option from the 'Windows' menu
- Select the vectorized flow from the model or from the 'Elements' window :
- The corresponding vector will be selected in the 'Vectors' window
or

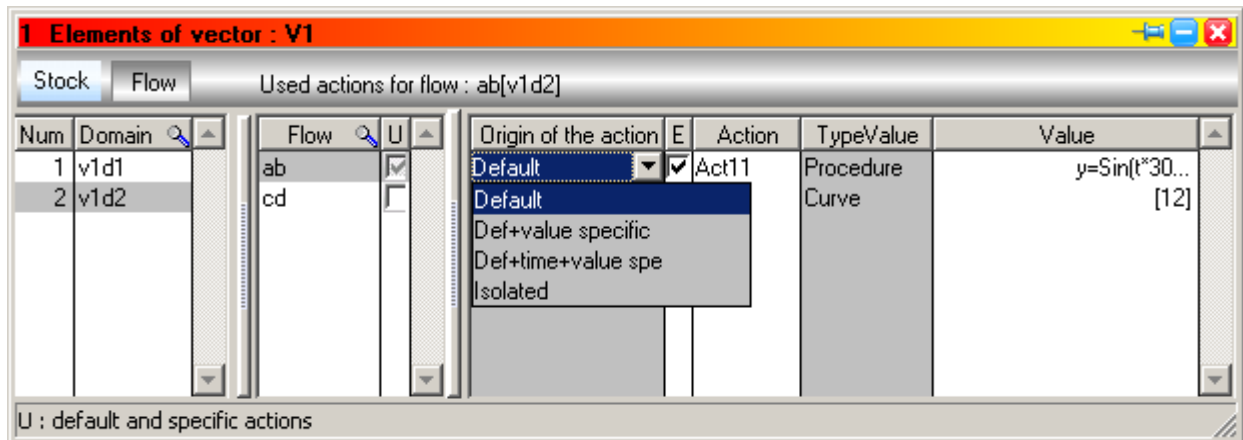
In the 'Vectors' window :

- Select the vector
- Click on the green led 'Ed' or
- Select the 'Open the window Vectorized elements' option from the context menu of the table of vectors

In the 'Elements of vector' window :

- Click on the 'Flow' button to view the plan of the flows
- Select the domain and the flow you wish to initialize
- Select the action to initialize
- Select the origin of the action

Selection of the 'Act27' action of the 'ab' flow for the 'V1D2' domain



- Notes : if the pin is disabled, than :
 - the selection of a vectorized flow from the model or from the 'Elements' window selects the flow from the 'Elements of vector' window
 - the selection of a domain in the 'Vector' window selects the domain from the 'Elements of vector' window

- Note : the selection of a flow from this window selects the flow from the model and from the 'Elements' window

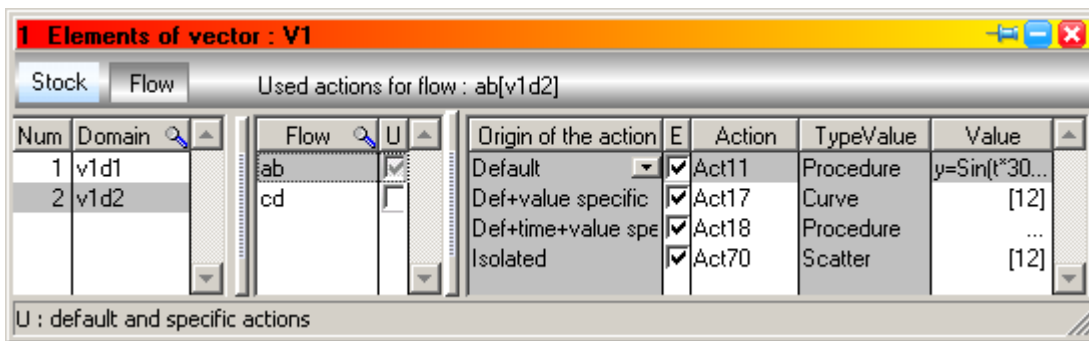
- Tip - to reset the actions, by default, of all the duplicated flows :
 - Select the 'Vector disable' option from the context menu of the selected flows in the model,
 - Modify the actions,
 - Enable the vector by selecting the 'Vector enable' option from the context menu or use the 'Vector' button in the left toolbar

2. Origin of the action by domain

Options

- ❑ 'Default' :
 - the action will inherit all the parameters of the action of the flow before the activating the vector
- ❑ 'Def+value specific' : Default + specific value :
 - the action will inherit all the parameters of the action of the flow before activating the vector, except for the parameters 'ValueType' and 'Value' : they will be specific for this action
- ❑ 'Def+time+value spe' : Default + temporal parameters + specific value:
 - the action will inherit all the parameters of the action of the flow before activating the vector, except for the temporal parameters, the parameters 'ValueType' and 'Value' : they will be specific to this action
- ❑ 'Isolated' :
 - this option adds a new action in the flow, for the selected domain

The choice of the action origin for the selected domain, flow and action



Column 'U', only in display

- ❑ no checked : all the action are by default
- ❑ checked and grayed : at least one action is specific for one domain
- ❑ checked and not grayed : all the actions are specific for the domains

Column 'E'

- ❑ enables or disables the action, this box has priority over the 'E' box from the 'Flow' main table

'Flow' main table

Ed	Flow	Origin	Action	E	Chron?	Chrono	Start	Interval	Repeat	Type	Cycle	CycleType	Value	Val
	ab[v1d2]	Default	Act11	<input checked="" type="checkbox"/>	1	0	1	1	12	Default		Procedure	y=ξ	
	ab[v1d2]	Def+value specifi	Act17	<input checked="" type="checkbox"/>	1	0	1	1	12	Default		Curve	[12	
	ab[v1d2]	Def+time+value s	Act18	<input checked="" type="checkbox"/>	1	0	1	1	12	Float defau		Procedure		
	ab[v1d2]	Isolated	Act70	<input type="checkbox"/>	1	0	1	1	12	Default		Scatter	[12	

- ❑ the 'Origin' column indicates the origin initialized in the 'Elements of vector' window
- ❑ the 'Flow' column indicates the name and the domain of the flow selected in the 'Elements of vector' window
- ❑ Initialize the parameters of the action, if they are active or different from those of the default action
- ❑ Delete the isolated action from this window, if necessary