

Sequences



Sequences have been enhanced: we recommend you to read the Sequence section in its overall to discover more about:

- scheduling actions: "iterative create last step and add" mode
- interface change for action duration
- Delay option
- Color and transparency actions

To have a look, please click on the appropriate keyword in the [What's New](#) section (items under Sequences)



[About sequence capabilities](#): provides background information about sequence capabilities.

[Sequence editor](#): provides information about the sequence editor

[Display Gantt chart](#): provides background information about the Sequence Gantt Chart.

[Define a sequence](#): Click the Edit Sequence icon, add actions, sequence them, modify the actions duration if necessary. Click the Edit Analysis tab and add interferences and distances. When satisfied click OK.

About Sequence Capabilities



A sequence is a way to put together and schedule actions to perform simulations.

Sequences are persistent and can be stored in your document.

What is an action?

Actions are entities of different nature organized within the sequence.

They can be objects from the following list:

- tracks (camera tracks, product tracks, shuttle tracks, section plane tracks, light tracks) please refer to [About Tracks Capabilities](#)
- color and transparency actions ()
- visibility actions i.e. Show/Hide ()
- simulations (R6 simulations)
- sequences ()

- *FEA Analysis*

Please read "*DMU Engineering Analysis Review*"- Animating Images

- mechanisms which can be simulated with laws

Please read "Running Mechanisms within a Sequence" in the *DMU Kinematics Simulator User's Guide*

About actions duration:

Actions are characterized by a duration:

i.e. Track duration is linked to the trajectory length

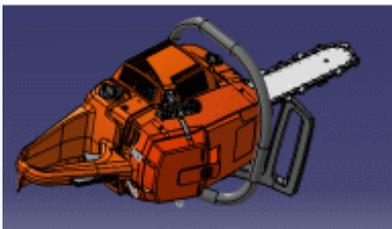


About Visibility and color actions

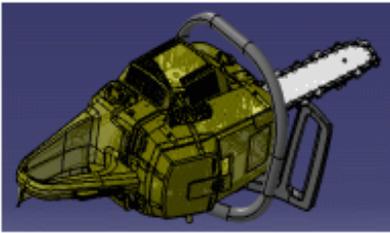
Using a color/transparency action, you could only define an initial and a final state. This highlight aims at offering more capabilities for Color/Transparency actions based on the track model:

- recording of multiple states for the same action using the standard graphic properties toolbar.
- possibility to change the object on which is applied the action
- recording capabilities using the same Recorder tool than the track
- time edition of the action (possibility to change the duration of each segment).
- VB exposition
- The visibility or color actions are created in sequence context and their effects are seen only when you use the Player (in the sequence for instance)
- color and transparency actions have now a duration
- Visibility actions are instantaneous (duration=0)
- For more information, please refer to [Defining a Sequence](#)

Initially the product looks like this:

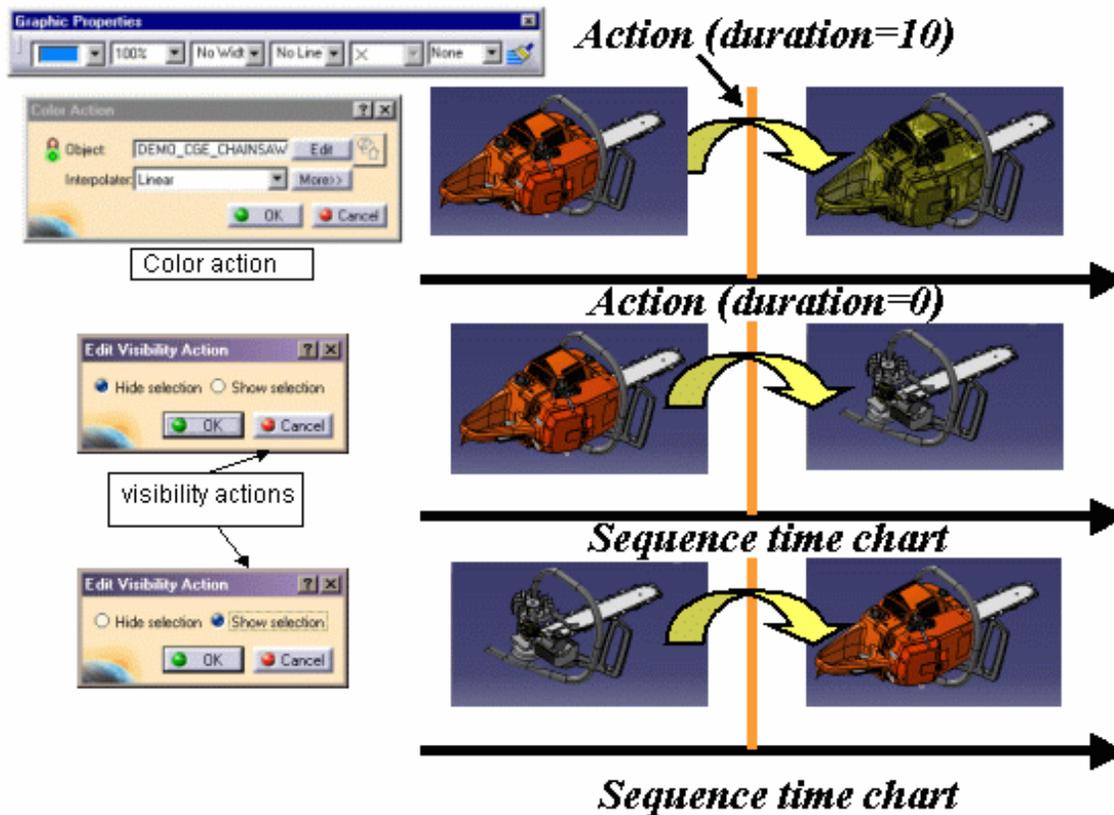


when creating a color action in the sequence, it becomes:



Make sure though, you schedule this action properly using the Action Delay parameter (i.e. depending on the effect you want to obtain)

The picture below gives you the various results after action creation according to the option set:

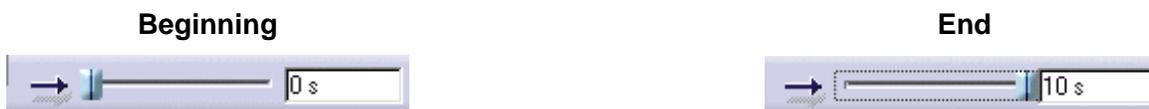


This duration is recovered in the sequence but you can also apply a specific duration in sequence context.

Example:

Duration in the player of a sequence comprising two tracks:

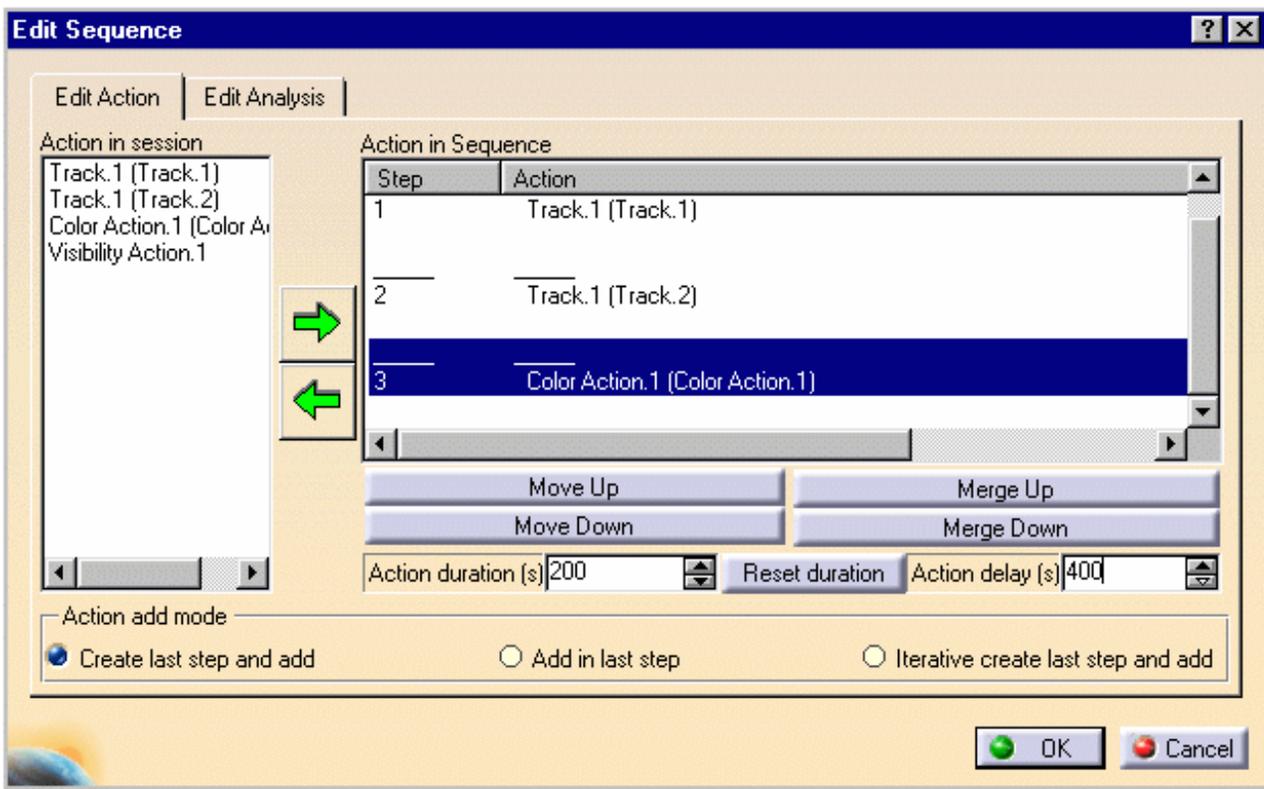
The two actions are scheduled to start one after the other (see: [sequencing modes](#))



About Action Modification

You can modify the action duration, all you need to do is:

- select the action in the Actions in Sequence list
- Enter the new value in the action duration (i.e. 200)
- If you need a delay, enter a value in the Action delay field (i.e. 400)
- You can use the Reset button to swap to the default action value (intrinsic duration)



About sequencing

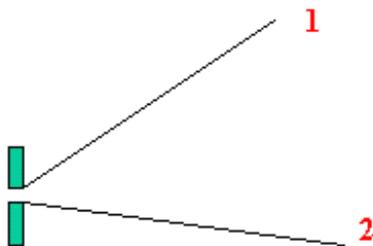
Sequencing aims at defining a time frame within which the actions are scheduled.

Two sequencing modes are available:

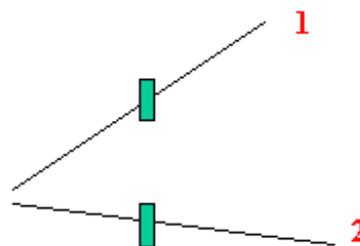
- actions start together (**simultaneous mode**)
- actions start right one after the other (**consecutive mode**)

Simultaneous mode

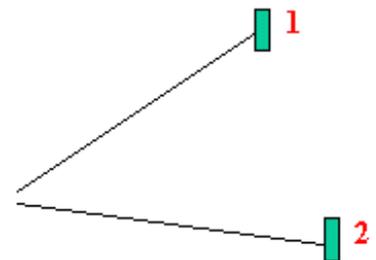
Beginning



Middle



End



Consecutive mode

Beginning

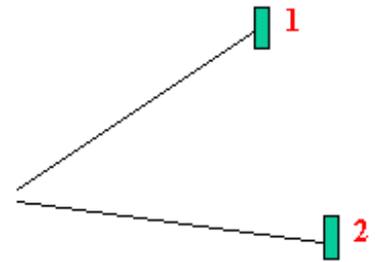
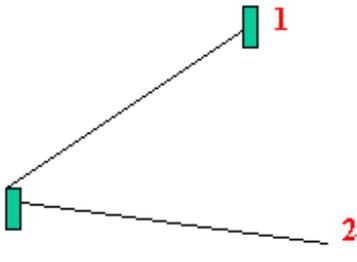
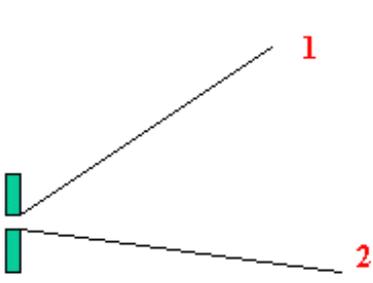


Middle



End



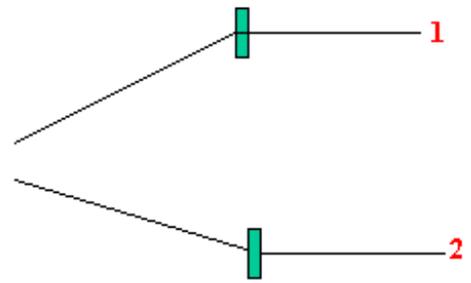
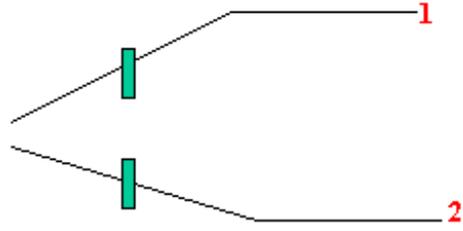
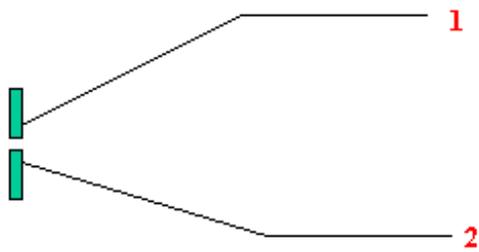


i You can combine the two modes and modify the scheduling at any time.

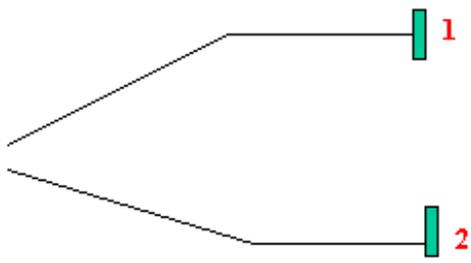
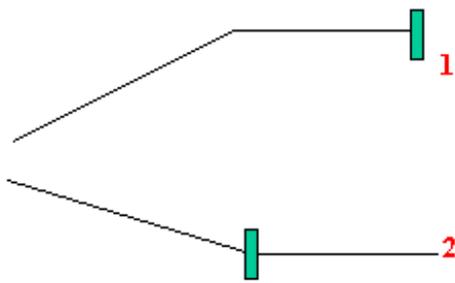
Sequences lets you put together existing actions, anyway, you can easily create a new action on the fly and add it in the current sequence. This capability lets you edit actions in context and synchronize meeting points in different actions.

The example below illustrates the two modes combination:

Simultaneous mode



Consecutive mode



About Journaling/automation

Sequences are journalized. You can generate a macro using Tools->Macro->Record... (see the Infrastructure user's Guide)



Sequence creation:

3 methods are available to create sequences:

1. There are existing actions in your document (actions in session list),
 Click the Sequence icon , and add them using the arrow into the Action in sequence list and schedule them, using the sequencing tools (Refer to: [Sequence editor](#))
2. Open an empty sequence and create actions on the fly (the sequence editor remains opened)
3. Combine the two methods (1. and 2.)

Sequences created in this manner are persistent and can be stored in the document. They are listed as separate entities in the specification tree and can be selected at any time and modified.



Sequence Editor



The sequence editor lets you manage and simulate **actions** from the following:

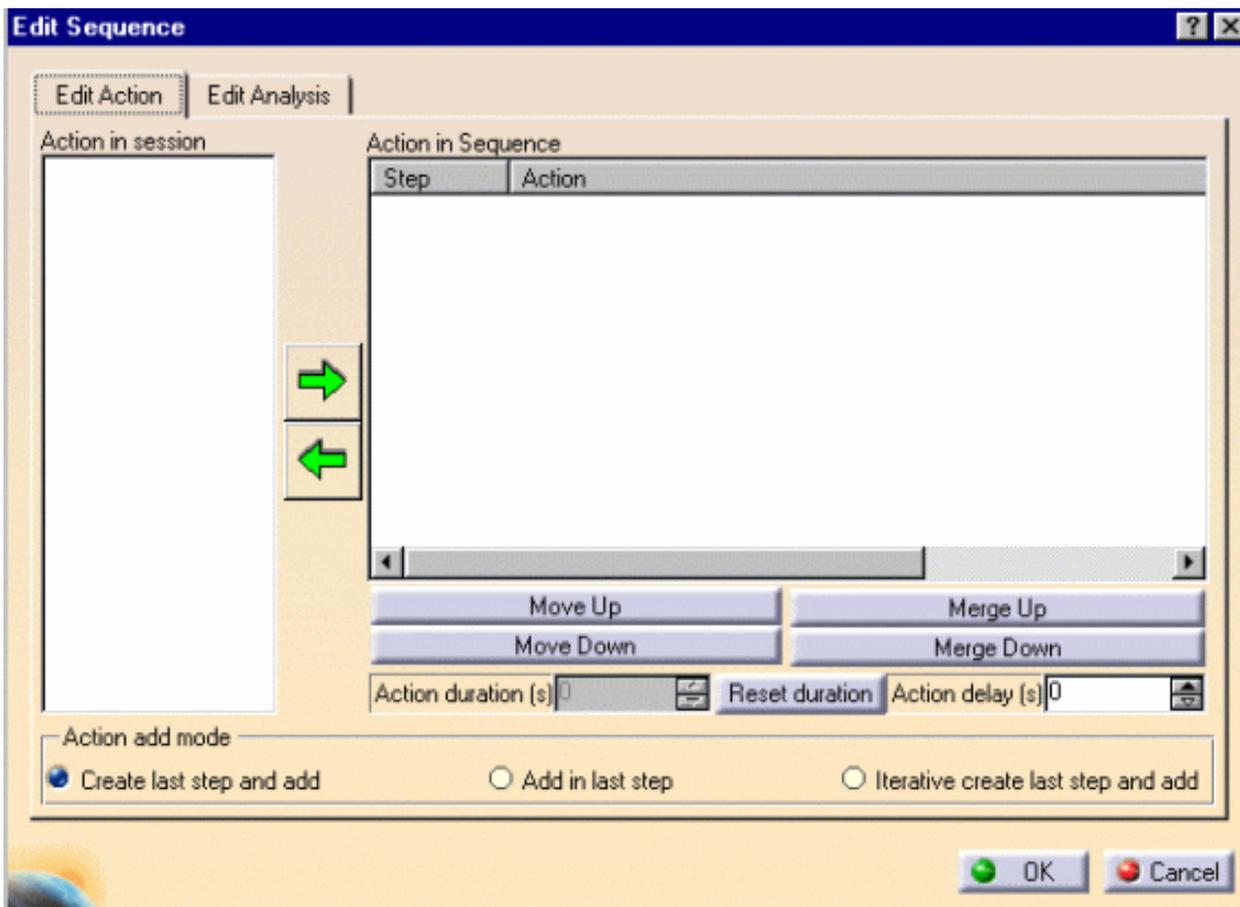
- moving objects (part, camera, ...)
- graphic attributes (show/hide, colors, transparency)

you can also manage time with Gantt chart

Let's look at it more carefully:

The Edit Sequence dialog box comprises of two tabs:

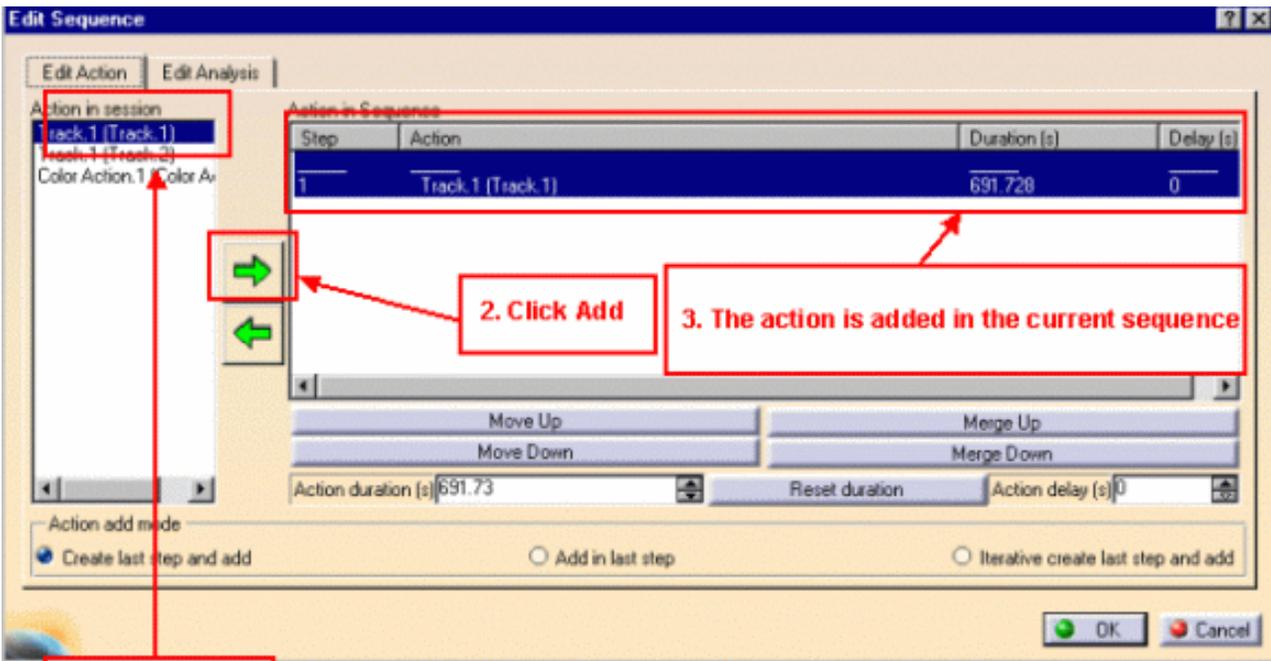
- **Edit Action tab**
- **Edit Analysis tab**



The Edit Action tab lets you perform the following operations:

- Add/remove actions using the green arrows

1. Select an action in the "Action in session" list and click . The action is added in the sequence list. See example below:



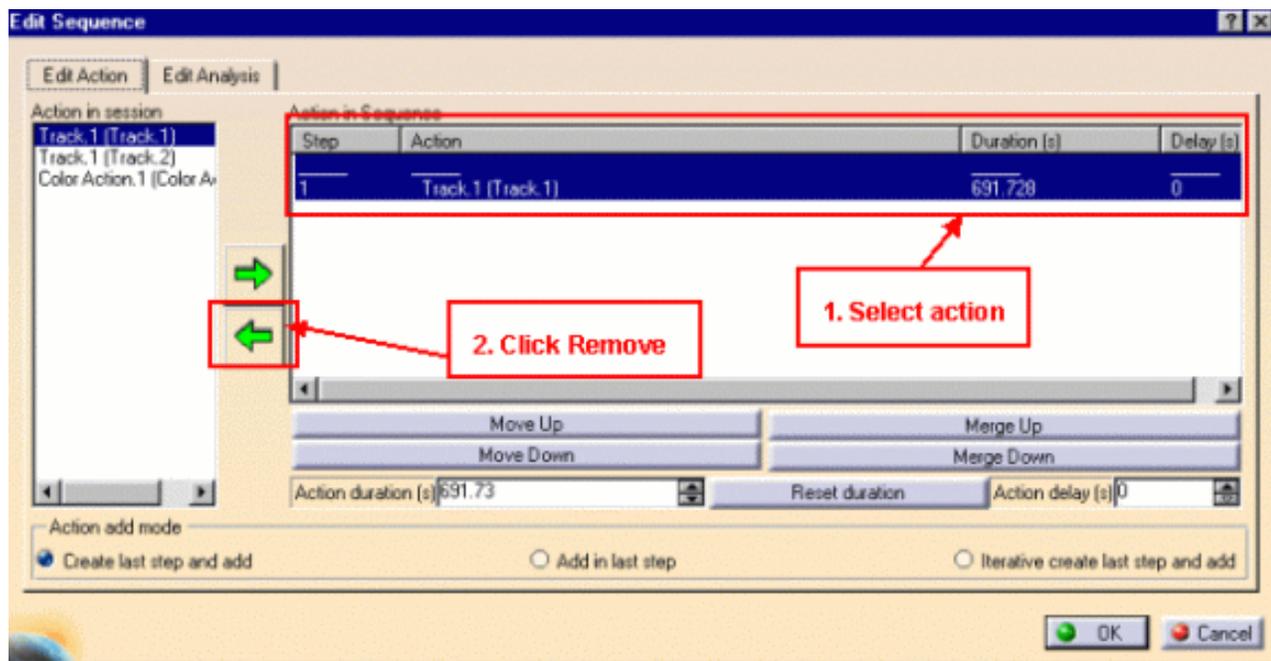
1. Select action

2. Click Add

3. The action is added in the current sequence



2. Select an action and click . The action is removed from the "Action in Sequence" list



2. Click Remove

1. Select action

Note: If you multi-select actions in the session list and click the Add button, the actions are added in simultaneous mode.

- Customize the add mode settings:
 - (1) **Create last step and add** option: creates a last step and add the selected action into it (default mode) (in **consecutive mode**)
 - (2) **Add in last step** option: lets you add an action in last step (in **simultaneous mode**)



- a new add mode appears

- (3) Iterative create last step and add** option: lets you add the actions in consecutive steps (1-2-3...)

(1)

Step	Action
1	Track.1 (Track.1)
2	Track.1 (Track.2)

(2)

Step	Action
1	Track.1 (Track.1)
1	Track.1 (Track.2)

(3)

Step	Action
1	Track.1 (Track.1)
2	Track.1 (Track.2)
3	Color Action.1 (Color Action.1)

- Sequence actions using:

if working in **consecutive mode**

- Move up:** moves up a selected action
 - Move down:** moves down a selected action

if working in **simultaneous mode**

- Merge up:** merges the selected action up
 - Merge down:** merges the selected action down



Note: remember you can combine the two modes within the same sequence.

Please read [About Sequence Capabilities](#)



- Customize the action duration

- action duration:** the numerical field lets you enter a specific duration for an action (this capability enables to simulate the same action with a different time scaling)
 - reset duration:** lets you reset the selected action to its intrinsic duration

Action duration (s) 200 Reset duration Action delay (s) 400

Action duration (s) 691.73 Reset duration

Reset default duration

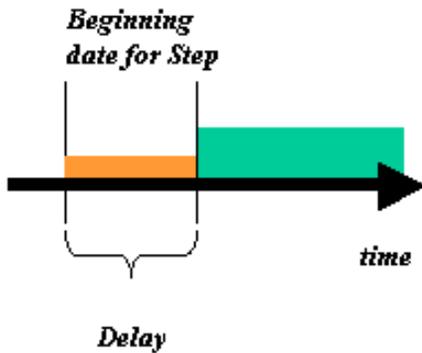
Note: you can enter a specific duration for all action types except visibility actions which are instantaneous (duration=0)

Action duration (s) 0

- A new option is available :
 - **action delay:** lets you delay the starting time of an action (i.e. it is now possible to overlap two actions)

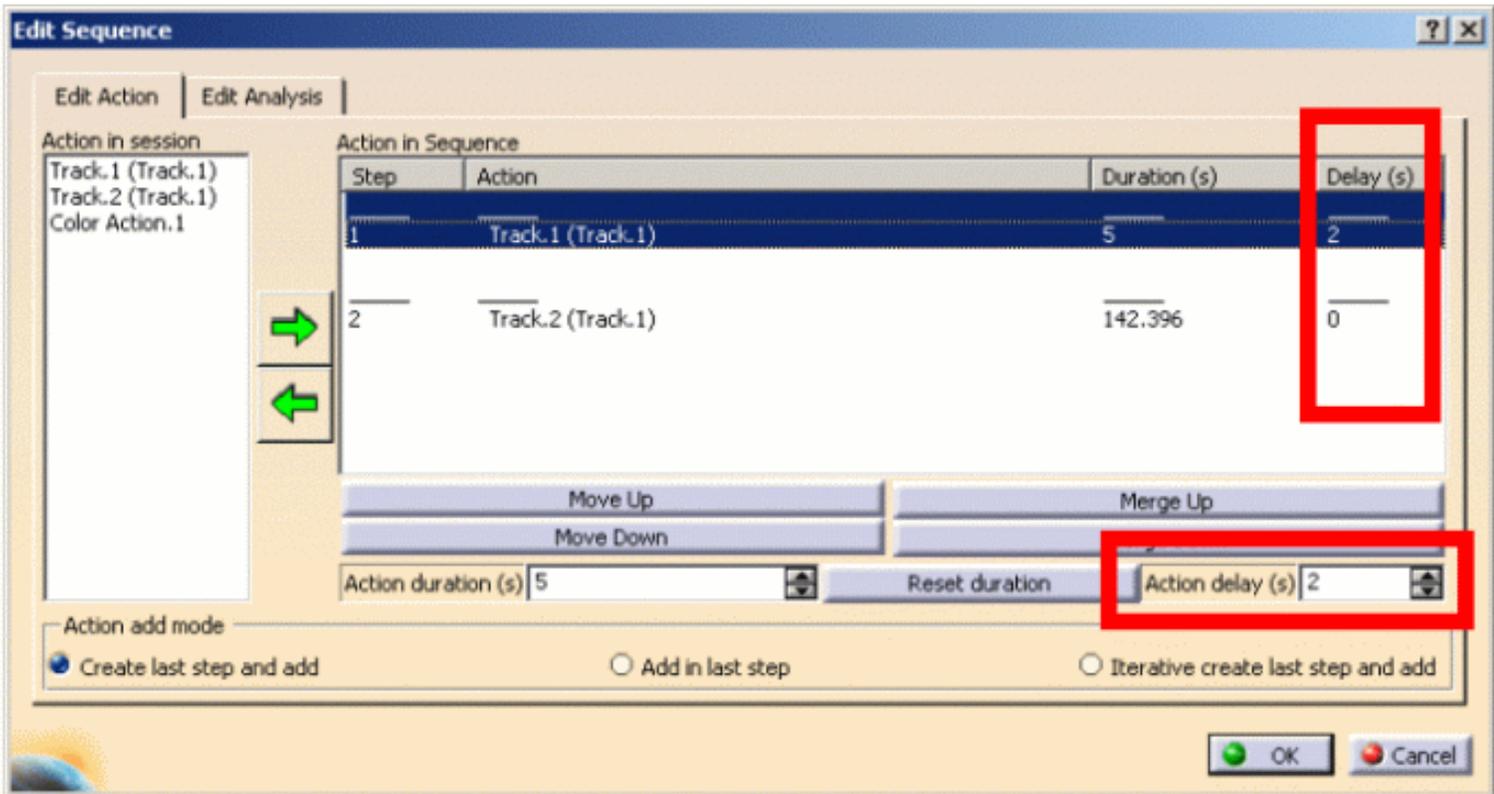
For instance, two tracks within the same sequence step can be synchronized, in order to achieve passing by specific waypoints simultaneously.

For all actions contained in the sequence, the delay is a time attribute, just like their duration. It means the action will start with respect to the specified delay with the theoretical beginning of the step, which the action belongs to. Valid delay values are zero or positive.

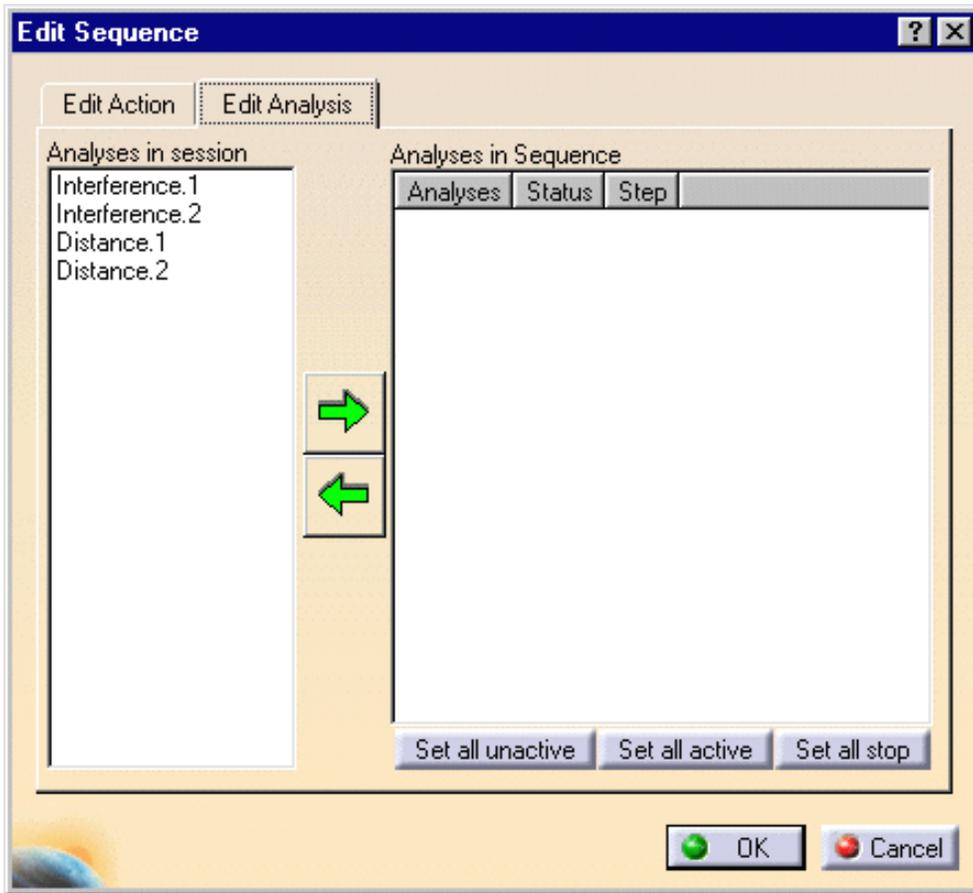


The actions appear in the "Action in sequence" list, they are scheduled in steps and their duration and delays are displayed.

Note: To apply a delay to an action or modify it, all you need to do is select the required action in the Action in session list and enter a value in the Action delay field:



Also read : [About actions duration](#)
 Now click the *Edit Analysis* tab:



The Edit Analysis tab lets you perform the following operations:

- Add/remove interferences or distances using the green arrows
 - 1. Select an analysis in the "Analyses in session" list and click add. The action is added in the sequence list.
 - 2. Select an analysis in the "Analyses in Sequence" list and click remove

Note: you can add existing interferences or distances or create them on the fly (in this case they are automatically displayed in the "Analyses in session "list

- Set the clash detection mode
 - **Set all inactive** option: (default mode) as you simulate your sequence, the detection is set to off, the interferences and/or distances defined in your sequence are not taken into account
 - **Set all active** option: as you simulate your sequence the detection is set to on, the interferences and/or distances defined in your sequence are taken into account
 - **Set all stop** option: as you simulate your sequence, the detection is set to stop (on collision), the simulation stops when an interference defined in your sequence is detected. The distances defined remain active.



About Editing an action and analysis

Double-click actions, interferences, distances to display the dedicated editor. Perform the required modifications, the modifications are automatically taken into account in the Edit Sequence dialog box.



Displaying Gantt Chart



This task shows you how to display the Gantt Chart viewer.

A Gantt chart allows users to do a basic, overall cycle-time analysis for a set of actions. The Gantt chart visualization is based on the cycle time parameter defined in each action.

About Gantt Chart:

The Gantt chart is another way to visualize your sequence. Note that you cannot modify the action duration using the Gantt window.

A Gantt chart is bar graph of a sequence. It shows start and stop times as well as dependencies. The Gantt chart is a 2D view of the sequence process.



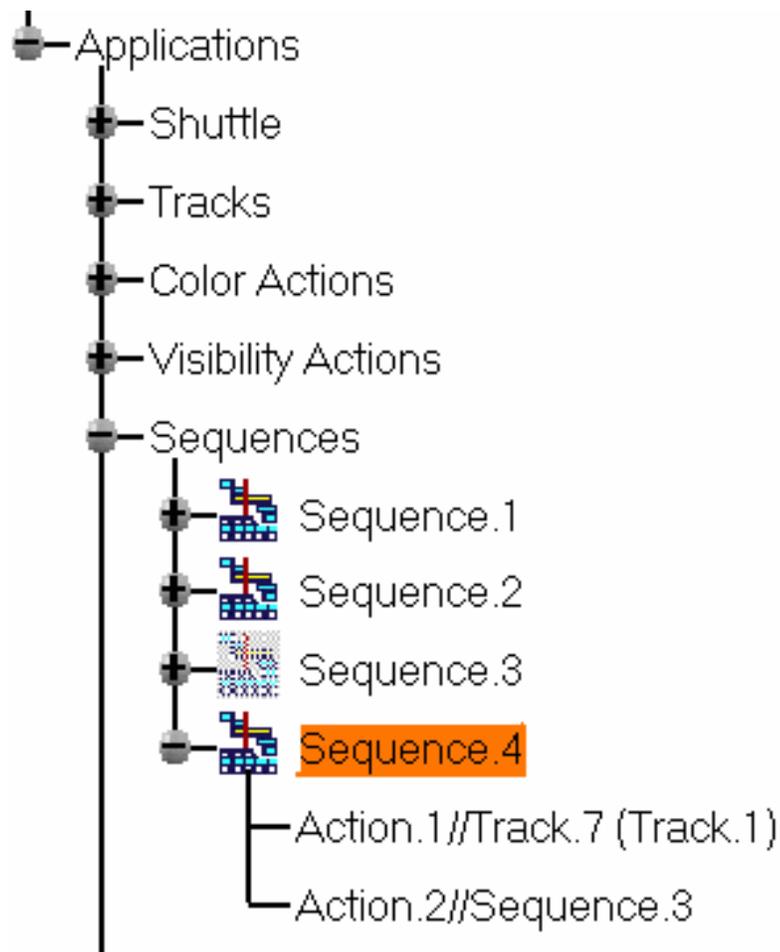
Open the [CHAINSAWAT.CATProduct](#) document

A sequence is defined



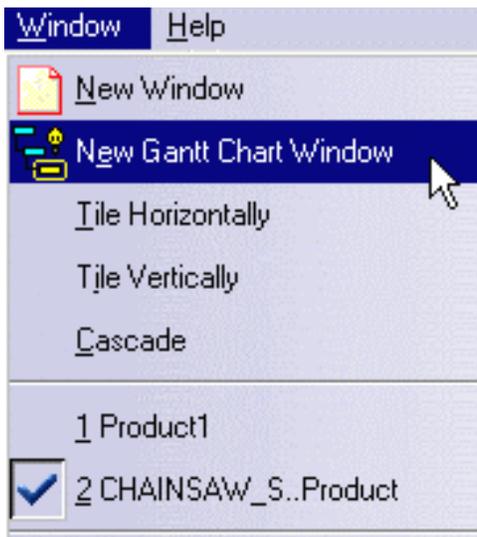
1. Select a sequence in the specification tree:

for instance Sequence.4

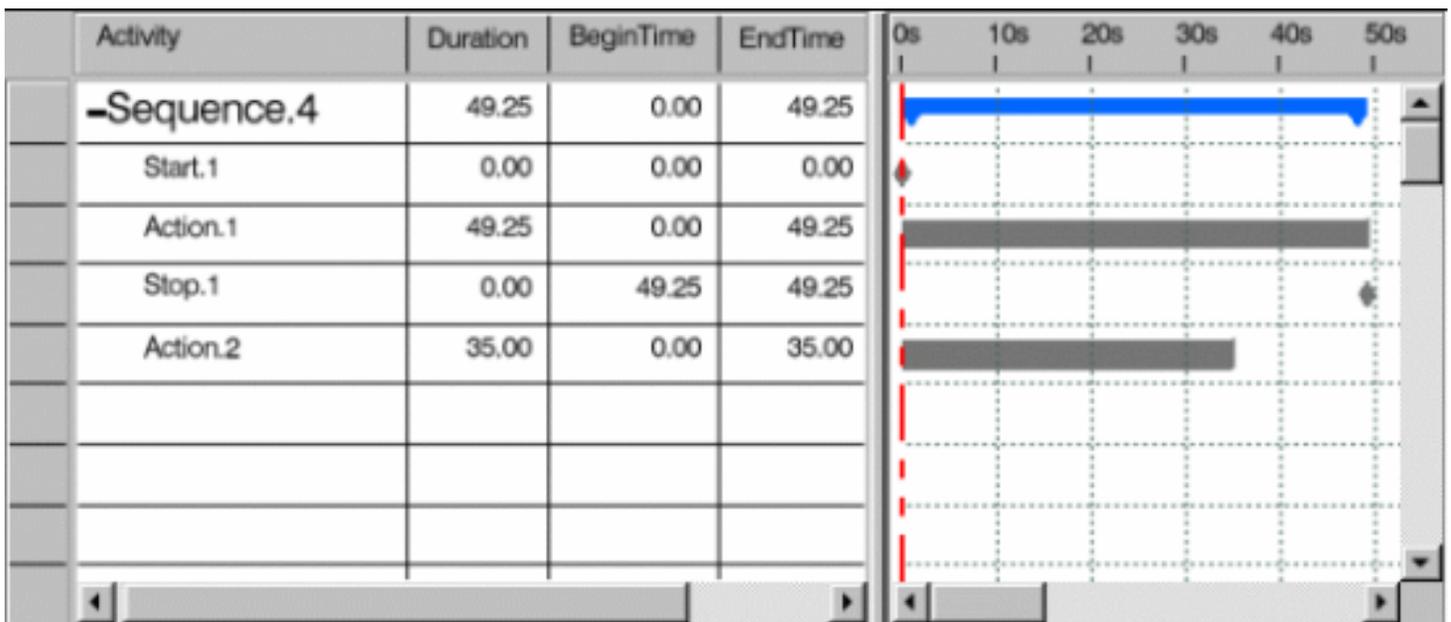


Gantt Chart for multiple sequences in a single Gantt Chart are not supported

2. Select Window->New Gantt Chart Window



The Gantt chart window is displayed:



Let's describe it more carefully:

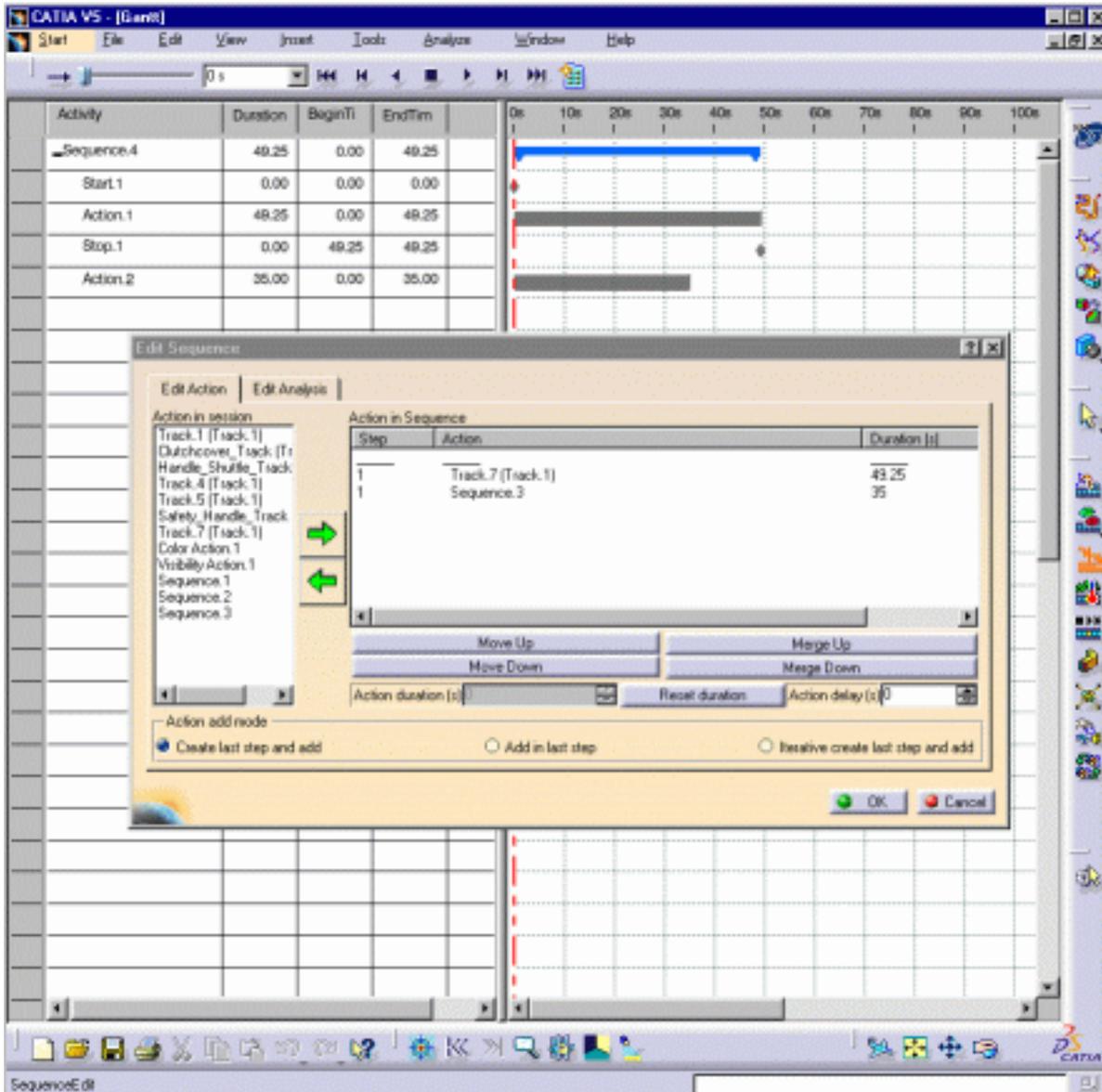
- The left frame of the Gantt chart lists each of the individual actions and /or analyses that exist in your document, displaying the duration, start time and end time for each.
- The right frame provides a graphical representation of each action or analysis (along the line of time) which also indicates the start, duration and end of each.
- A dashed vertical line in the right window (called the Time Line), provides a visual indication of the current time during the execution.

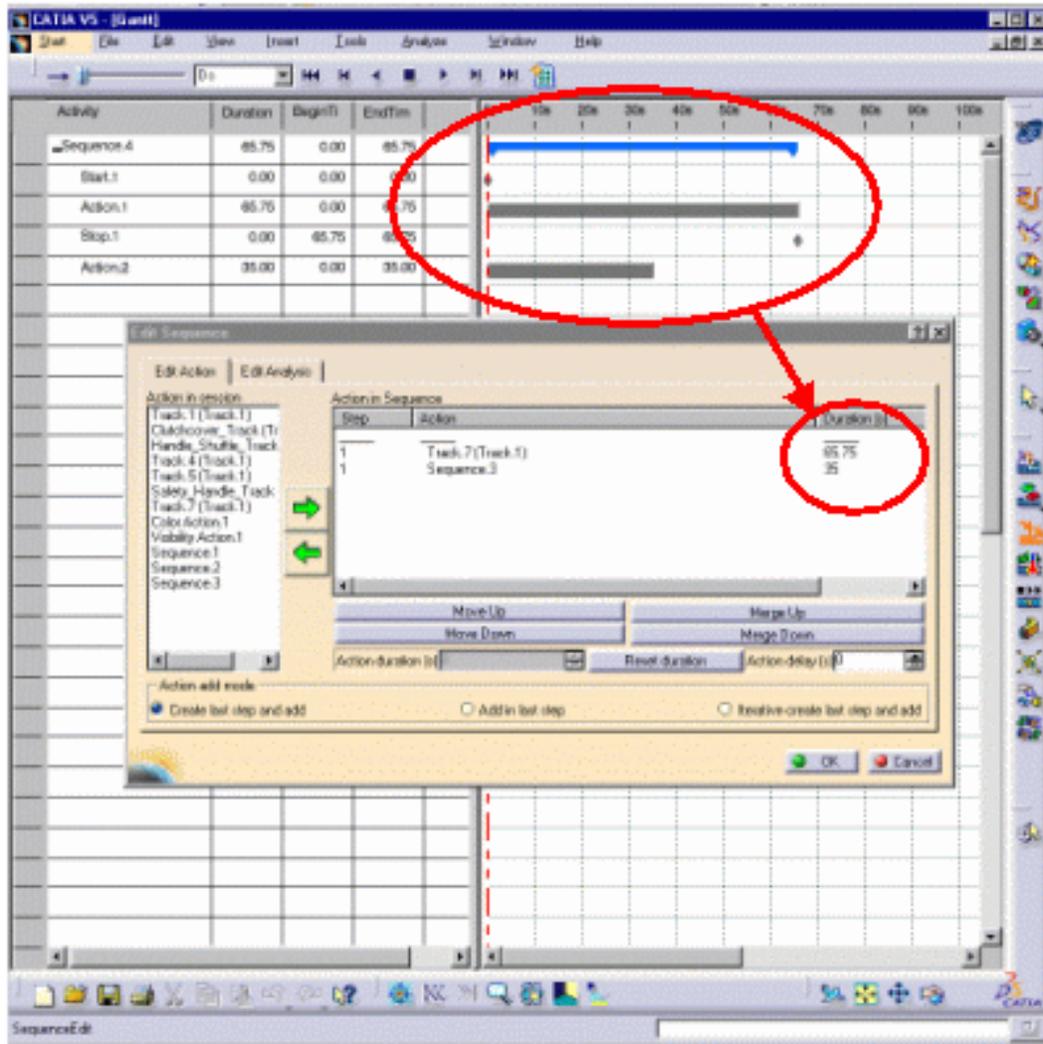


You can easily modify the action duration within the Gantt Chart, stretching the action graphical representation, the Gantt Chart as well as the Edit sequence dialog box are automatically updated.

For instance, double-click a sequence in the specification tree. You are in the sequence command.

Then select Window->New Gantt Chart Window:





It does work, the other way round: modifying the action duration within the Edit Sequence updates the Gantt Chart window automatically



Defining a Sequence



This task shows you how to define a sequence



Open the [DEFINE_SEQUENCE.CATProduct](#) document.

Tracks are already defined

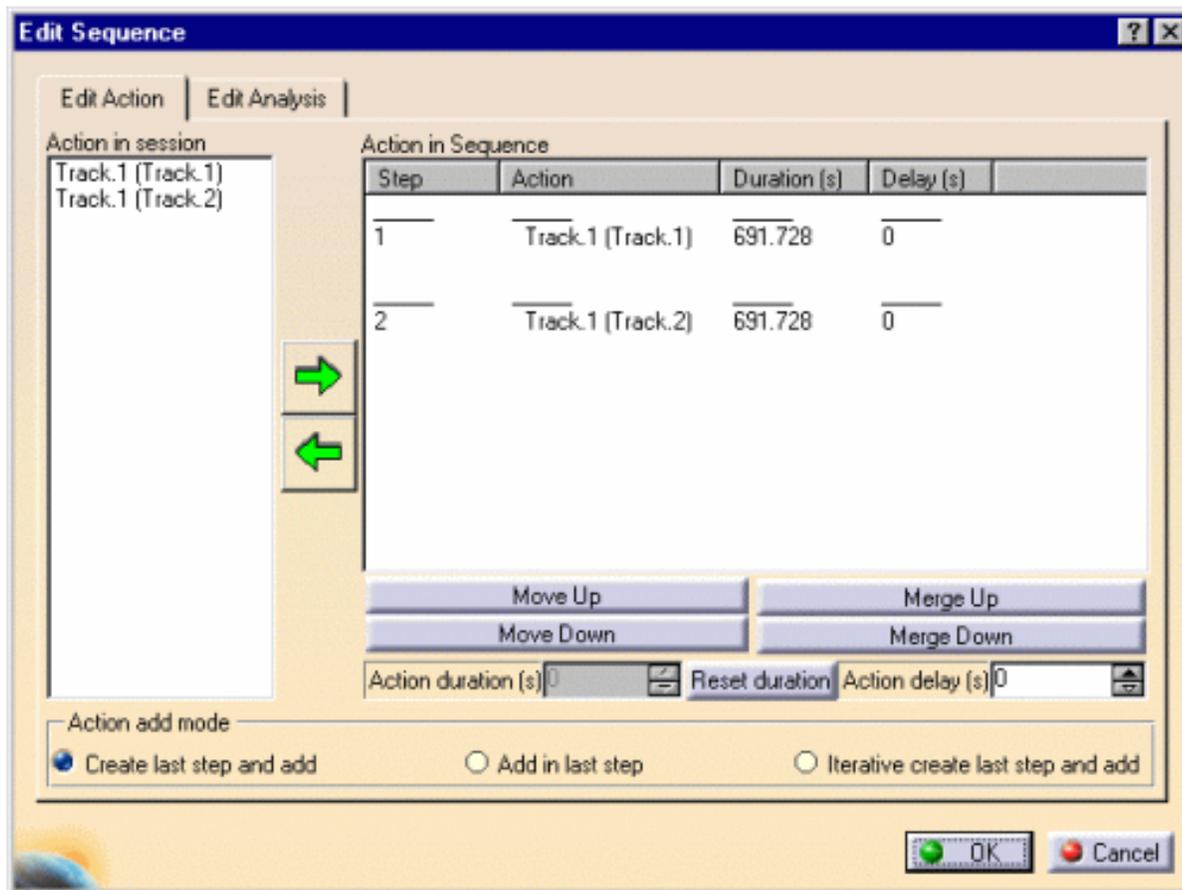


1. Click the Edit Sequence icon  in the DMU Simulation toolbar

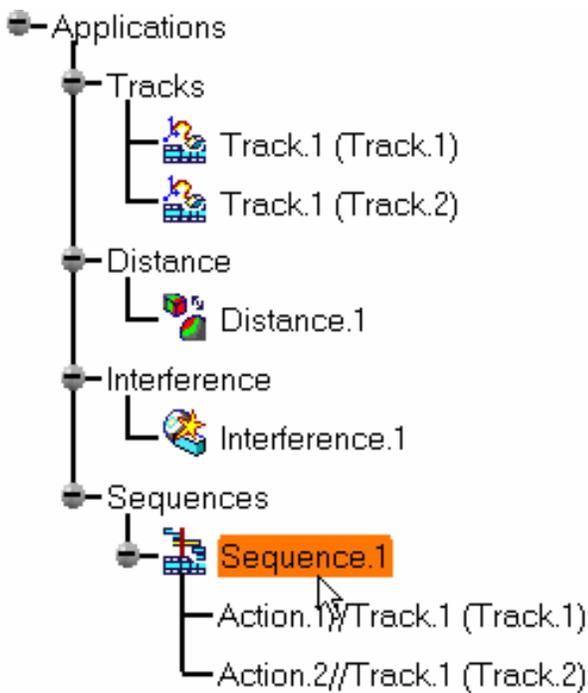
The Edit Sequence dialog box is displayed

2. Select Track.1 (Track.1) in the action in session list and click .

3. Select Track.1 (Track.2) in the action in session list and click .

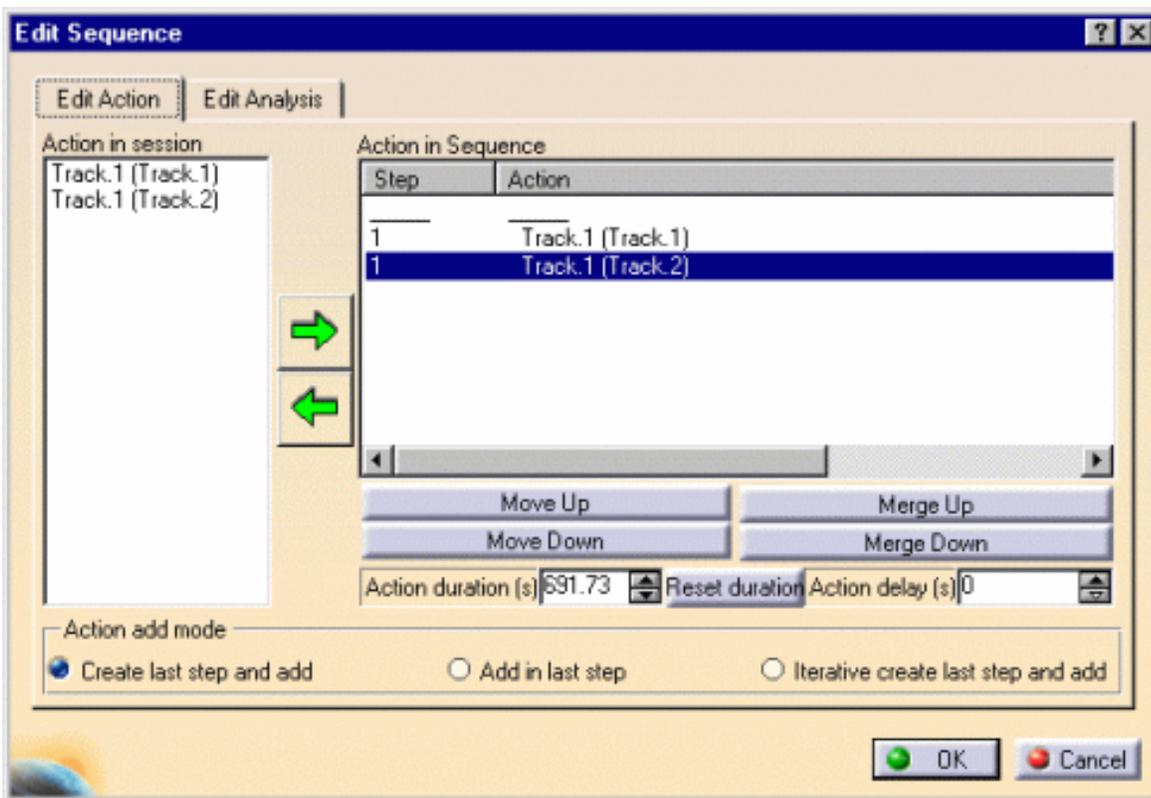


The Sequence.1 is identified in the specification tree



you want them to start together

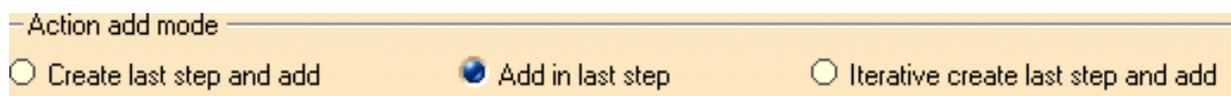
4. Click Merge Up button



The two actions will start together

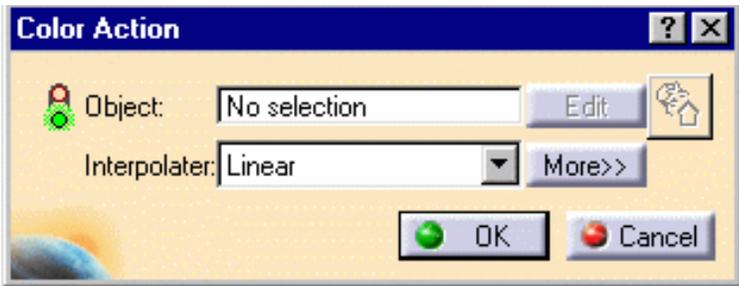
Note: you could have selected both (simultaneous mode) in the action in session list.

5. Check the "Add in last step" option in the Edit Sequence dialog box (Create last step and add option is set by default)

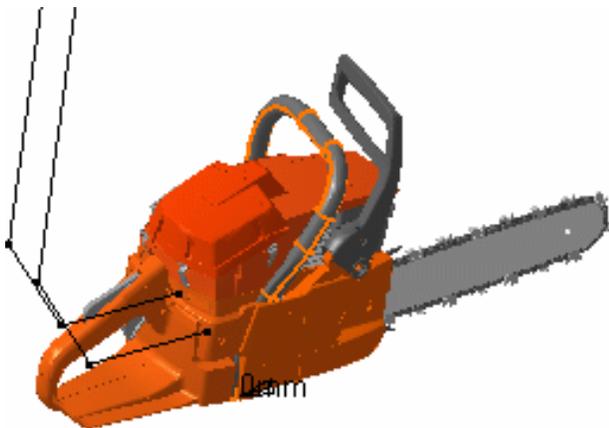


6. Add a color action (you are going to [create it on the fly](#)), for this

Click the Color action icon  in the DMU Simulation toolbar
The Color Action edition dialog box appears

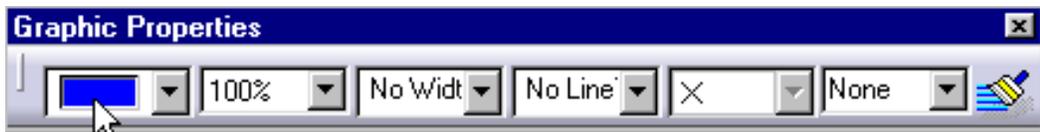


7. Select Handle.1 either in the specification tree or in the geometry area



The Graphic Properties toolbar appears

8. Select a color of your choice using the arrow and combo list. For instance blue

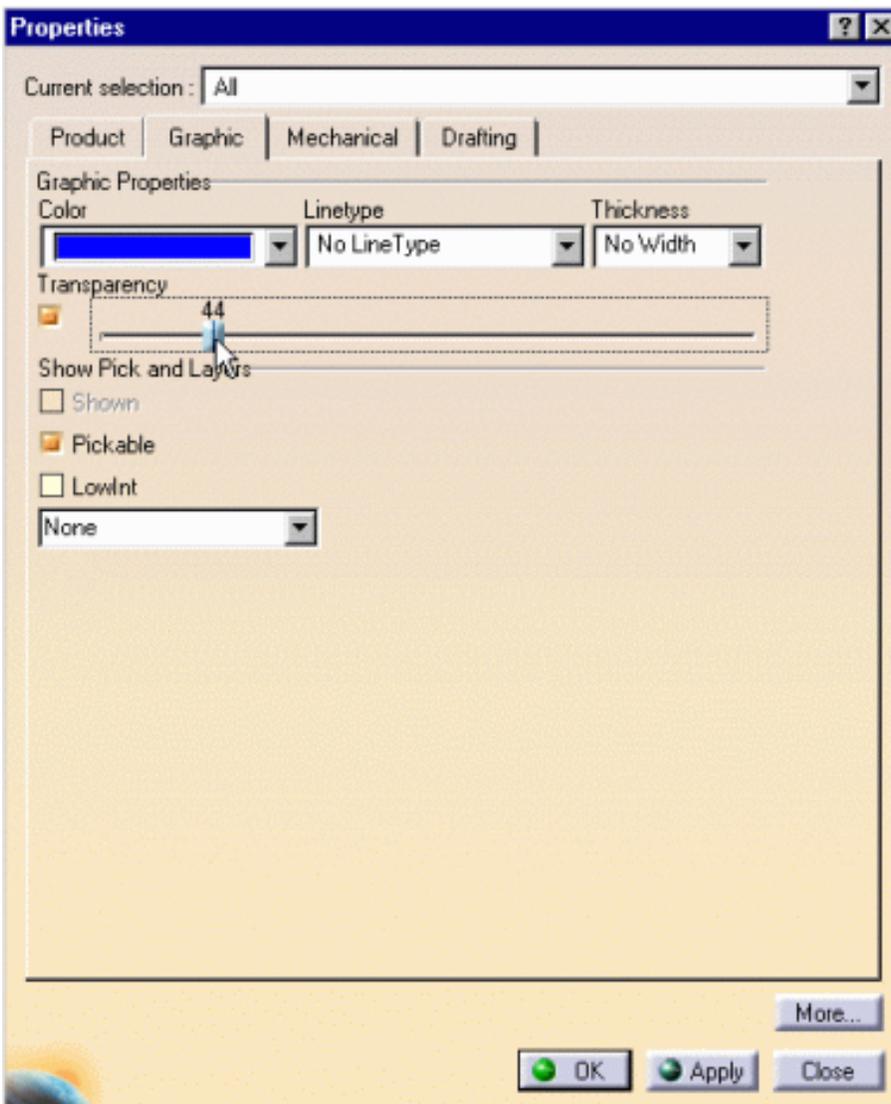


9. Click Record 

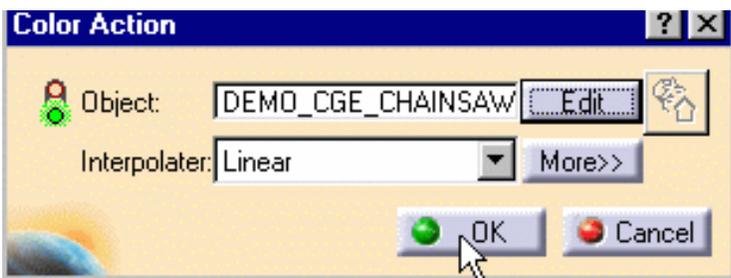
10. Set the transparency, for this:

- click the Edit button  in the color action dialog box
- select the Graphic tab in the Properties dialog box displayed
- check the transparency option if needed, and move the slider as desired

Note: you can access the Properties dialog box at any time to change color, transparency. The Graphic Properties toolbar a quicker way to modify graphic properties.

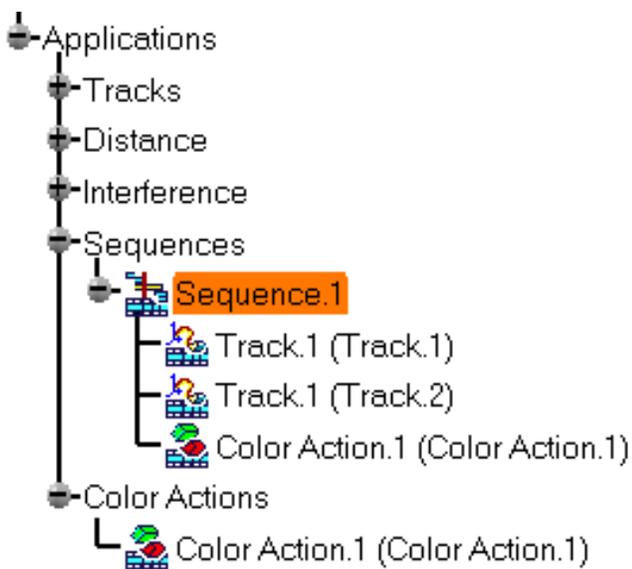


11. Click Apply, when done, click close to exit the Properties dialog box
12.  Click Record
13. Click Ok in the Edit Color Action dialog box when you are satisfied.



The color action is automatically added in the action in the sequence and identified in the specification tree

Step	Action	Duration (s)	Delay (s)
1	Track.1 (Track.1)	691.728	0
1	Track.1 (Track.2)	691.728	0
1	Color Action.1 (Color Action.1)	0.99717	0



14. Modify the action duration if necessary

For more detailed information, please read: [About Action Modification](#)

- Enter 200 in the Action duration field

15. Select the Color Action.1 in the action list and modify its delay:

- enter 400 in the Action delay field

Step	Action	Duration (s)	Delay (s)
1	Track.1 (Track.1)	691.728	0
1	Track.1 (Track.2)	691.728	0
1	Color Action.1 (Color Action.1)	200	400

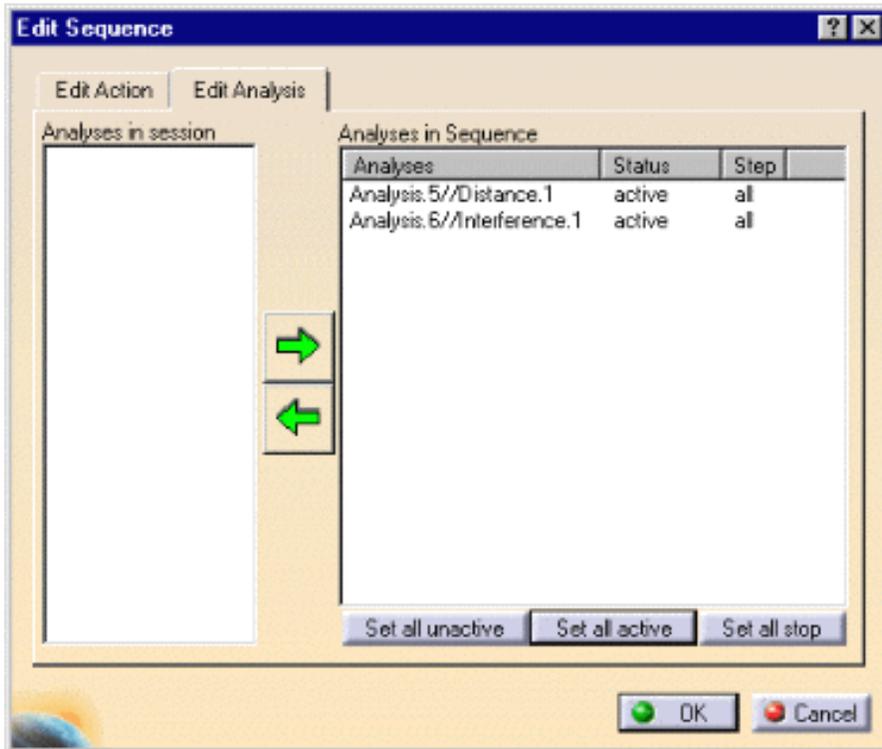
16 Play your sequence if needed using the Player

Now add analyses in your sequence for validation purposes

17. Click the Edit Analysis tab



18. Multi-select the existing analyses (i.e. Distance.1 and Interference.1) and click .
Note: you can create and add analysis specifications on the fly. You can also edit existing analysis specifications, double-clicking them in the "Analyses in sequence" list
19. Click Set all active button



20. Click Ok in the Edit Sequence dialog box when satisfied.

21. Select your sequence in the specification tree and click the player icon .
22. Simulate your sequence using the DMU Player buttons.

23. If you need to restore the initial positions, click the Reset icon .

24. Open the [DEFINE_SEQUENCE_RESULT.CATProduct](#) to check your result

