Streaming Activity simulation

On this page

You can model either *non-streaming* or *streaming* behaviors. Non-streaming behaviors consume their input object tokens at the moment they begin executing and deliver their output object tokens when they finish executing. If a system receives inputs and produces outputs even while behaviors continue to execute, this is referred to as a *streaming* behavior.

An Activity with streaming parameters is terminated in the following cases:

- An Activity whose only streaming parameters are output parameters is terminated once all of its actions finish executing.
- An Activity with streaming input parameters is terminated by an Activity final node or if the execution is explicitly terminated by the Activity that invoked it.
- If the **Terminate Streaming Behaviors by Output Parameter Multiplicity** project option (or Simulation Configuration property), is set to *true*, an Activity with streaming output parameters terminates when each of its output parameters receives a cumulative number of values equal to the upper bound of the parameter multiplicity.
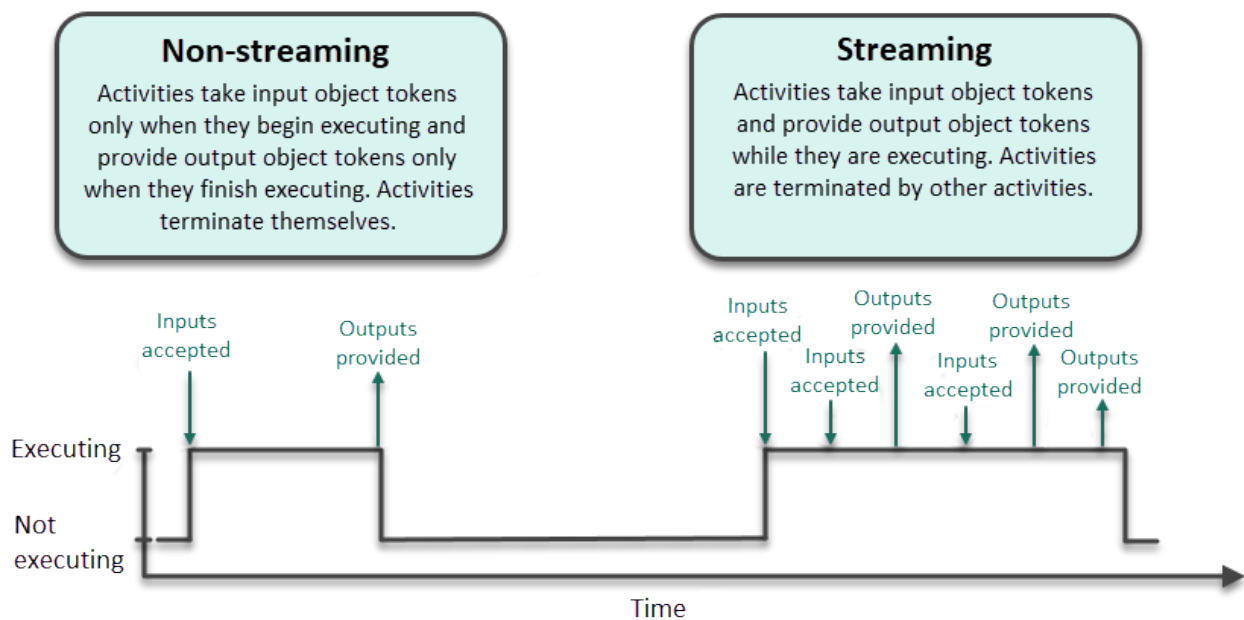
Non-streaming vs streaming behavior.

You can model a streaming behavior by setting the parameter of a Pin or Activity Parameter Node as streaming.

To set a parameter as streaming

- In the Specification window of a Parameter of a Pin or Activity Parameter Node, set the **Is Stream** property to *true*.

Setting a parameter as streaming.

> ⚠ **Streaming parameter multiplicity**
> We recommend specifying the multiplicity of [1..*], [*], or [0..*] if you want to get an unlimited number of tokens. Otherwise, the streaming input parameter stops receiving tokens when it reaches the upper bound of multiplicity.

Specifying parameter streaming rate

Streaming rate is the number of objects or values that flow in or out of the parameter per time interval while the behavior or operation is executing. You define input or output parameter streaming rate by specifying the **Rate** property which determines the expected rate at which tokens can arrive at or leave a Pin or Activity Parameter Node.

To specify streaming rate

1. Create an Instance Specification and name, e.g., *3 per min*.
2. Open the Specification window of the Instance Specification and set the **Specification** property to the number of objects or values that flow in or out of the parameter per time interval, e.g., 3.
3. Set the Instance Specification (created in step 1) as the value of the **Rate** property both for a Pin (or Activity Parameter Node) and for the parameter of that Pin (or Activity Parameter Node).
4. Open the Specification window of the Simulation Configuration and specify the **Time Unit** property by selecting the time interval per which the selected number of objects or values flow in or out of the parameter. If the **Time Unit** is not specified, a second is used as the default time interval.

Once you define parameter streaming rate, object tokens flow at fixed time intervals. This means that the specified time interval (step 4) is divided by a specified number of tokens (step 2). For example, if streaming rate is 3/min, object tokens are passed at fixed time intervals of 20 s. If a token does not arrive at the specified time, then that time interval is skipped and object token is passed only after the next fixed time interval. If there are more object tokens than an Action can accept, they wait in a corresponding Pin and are passed after the next fixed time interval.

To display streaming rate in a diagram

1. Right-click a Pin or Activity Parameter Node and select **Symbol Properties**.

2. In the **Symbol Properties** dialog, set the **Show Tagged Values** property to *true*.

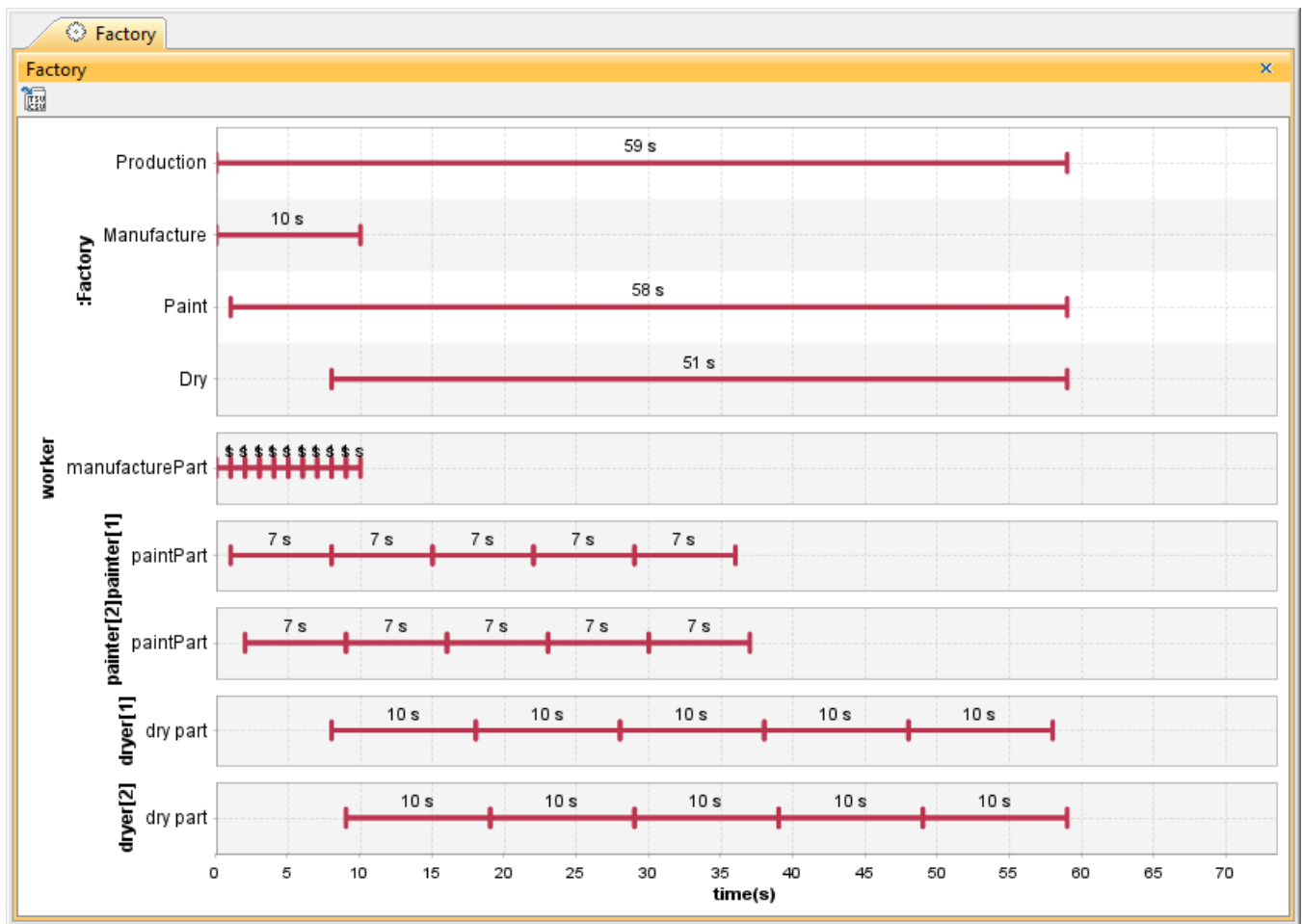## Streaming Activity animation

The Activity Diagram below shows an example of a streaming Activity where the *Manufacture*, *Paint*, and *Dry* Actions can be executed simultaneously. In this example, the *Manufacture* action has already finished executing and is annotated in green (visited element). The *Dry* and *Paint* Actions are executing simultaneously and are annotated in red (active elements). Note that you can control the held token display (annotated as red bubbles with the number of waiting tokens) in the **Project Options** dialog or Simulation Configuration properties.

The execution of this Activity will not terminate even when all the Actions finish executing.

An example of a streaming Activity

The following chart displays the timeline of the fully executed streaming Activity displayed above.

The timeline chart of a streaming Activity Diagram.