SysML Hands-On Exercises

Exercise 6.1
SysML Activity Diagrams

MagicDraw

August 2018

OBJECTIVES

The objectives of this exercise are to

- Create an Activity and Activity Diagram to model communications processing onboard the UAV.
- Use actions, object flows, activity parameter nodes and swimlanes.

This process is intended to represent modeling one part of the behavior of the UAV.

PREPARATION

1. This exercise assumes the student has Cameo System Modeler 19.0 (or MagicDraw 19.0 with SysML plug-in) installed correctly on his or her machine with a valid license for use.
2. The student should load the Part 6 course materials onto the computer, specifically Exercise 6.1 Starter UAV.mdzip and Exercise 6.1 Final UAV.mdzip.
3. The student should view the video Introduction to SysML Part 6 Exercise 6.1 in its entirety before attempting the exercise.

NOTES AND CAUTIONS

We recommend that the student watch the video demonstration of this exercise in its entirety before beginning their own work. The video includes background and explanatory material that is not repeated in the written instructions.

We also recommend that the student read the material carefully. The most common source of error is confusion between blocks, packages and diagrams, some of which have similar names. When the student is not sure what an element is, either in the browser or in a diagram, select that element and look in the Properties tab for the gray label that identifies the element type. Also, be careful in reading the instructions in realizing when an instruction should be carried out in the browser or in a diagram.

EXERCISE

6.1.1 Start Cameo System Modeler.

6.1.2 Open Exercise 6.1 Starter UAV.mdzip

6.1.3 Create an Activity and Activity Diagram

- Right-click on the **UAV Information Processing** package inside the **UAV Behavior** package in the browser.
- Select Create Element → Activity.
- Name the activity **Process Communications**.
- Right-click on the **Process Communications** activity and select Create Diagram → SysML Activity Diagram.
- Drag the other eight activities in the **UAV Information Processing** package into the diagram and arrange them roughly as in Figure 1.
- Name the actions and rearrange the pins as shown in Figure 2.
- Click on Activity Parameter Node in the Diagram Toolbar under the SysML Activity Diagram Heading, then click on the left boundary of the diagram frame when it highlights in blue. Click the Edit New Parameter box when it appears.
- In the Specification window, name the new parameter **Uplink Signal** and make sure the direction is set to *in*. See Figure 3
- Create 7 additional Activity Parameter Nodes as shown in Table 1.

Parameter Name	Direction
Downlink Signal	out
Flight Cmd	out
Camera Cmd	out
Radar Cmd	out
Uav Status	in
Camera Data	in
Radar Data	in

Table 1 Activity Parameter Nodes

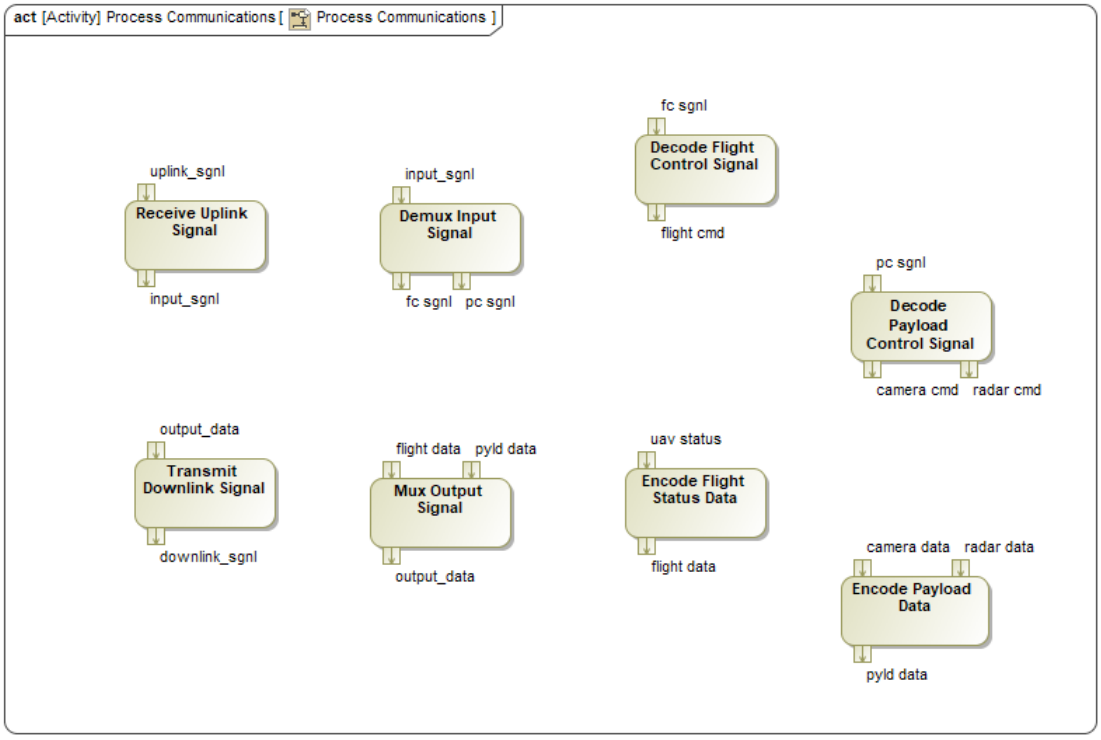

Figure 1 ***Process Communications*** *diagram, first stage*

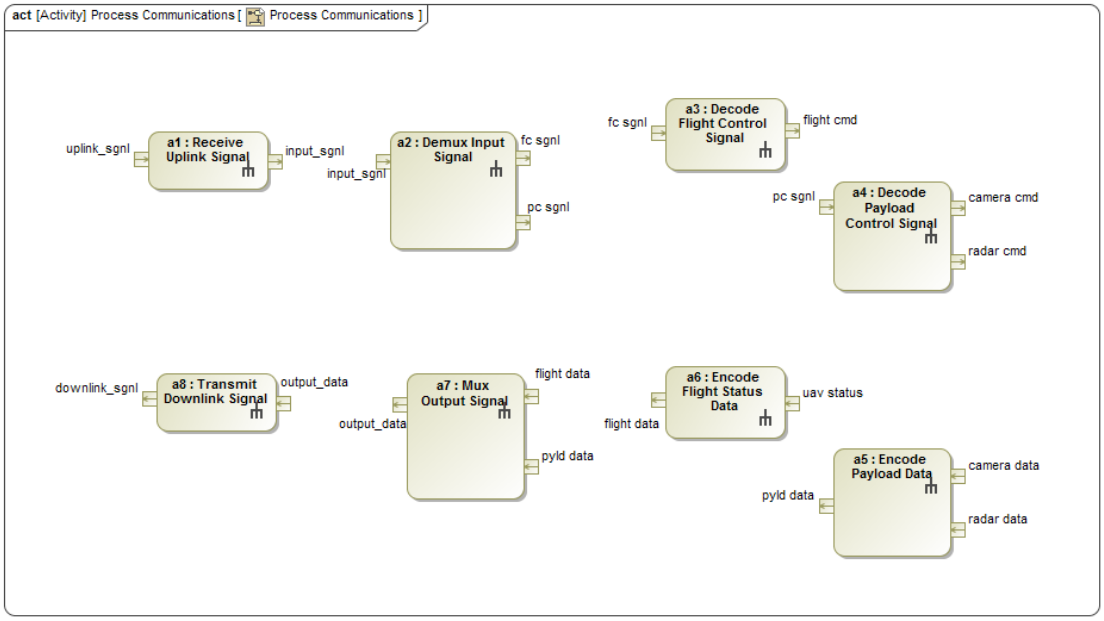

Figure 2 ***Process Communications*** *diagram, second stage*

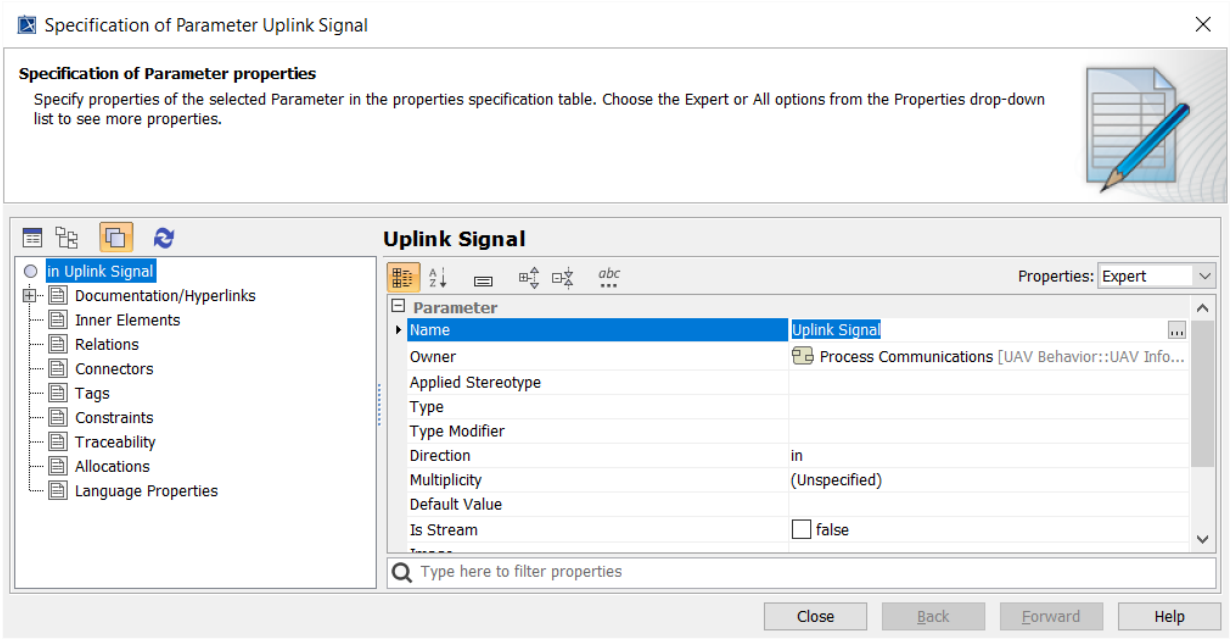

Figure 3 Specifying Activity Parameter Node

- While holding down the Alt-key, left-click one of the activity Parameter Nodes in the diagram, then right-click and select Symbol Properties. At the bottom of the list, check Show Direction.
- While holding down the Alt-key, left-click one of the activity Parameter Nodes in the diagram, then right-click and select Stereotype. Check Continuous and click Apply.
- The diagram should now appear similar to Figure 4.

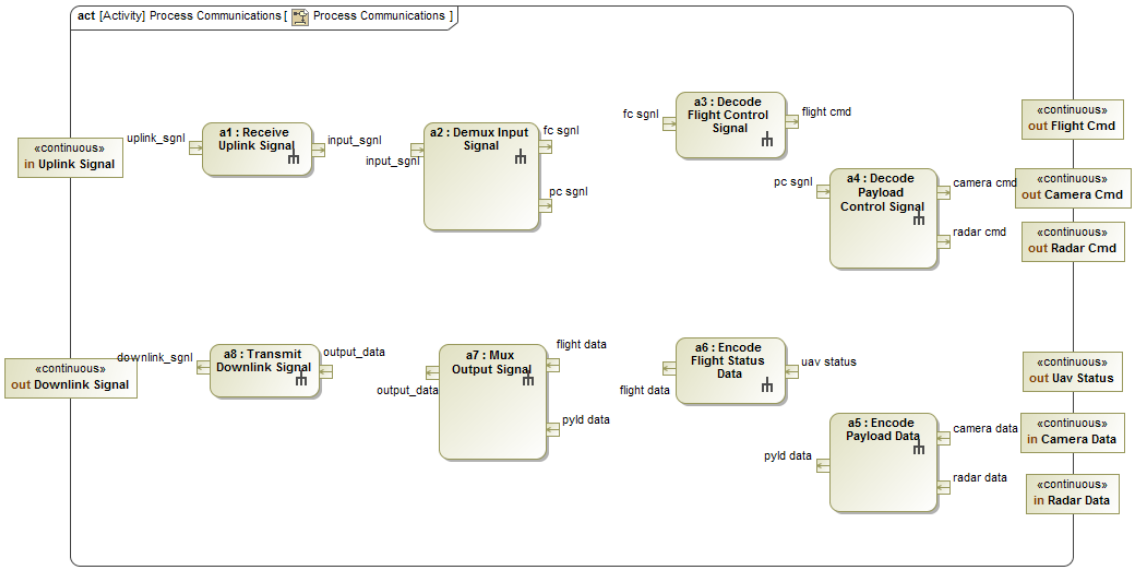

Figure 4 ***Process Communications*** *diagram, third stage*

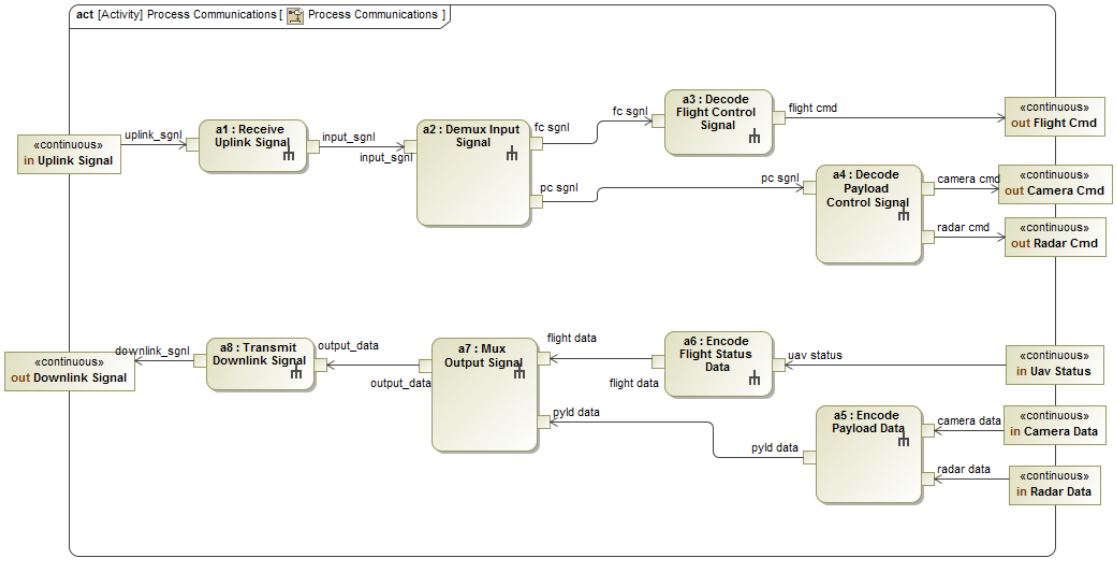

Figure 5 ***Process Communications*** *diagram, fourth stage*

6.1.4 Add Object Flows

- Select the **Uplink Signal** Activity Parameter Node, click the Object Flow icon in the Floating Toolbar, and drag the end of the object flow to the input pin on **a1:Receive Uplink Signal**.
- Repeat for all the object flows shown in Figure 5. Remember that object flows must be drawn in the correct direction, e.g. object flows cannot start from an input pin.

6.1.5 Add Swimlanes

- Select Vertical Swimlanes in the Diagram Toolbar and click inside the diagram. Drag and resize the swimlane boundaries to cover the first two pairs of actions,
- Right-click on the swimlane boundary and choose Insert Swimlane to the Right. Resize the swimlane to cover the third pair of actions.
- Repeat previous step for the fourth region. Open the validation window by clicking on the red error icon at the bottom, select all errors and choose Add Element to Partition.
- Drag the part property **ant1:Antenna** (inside the **Aircraft Platform** block) from the browser to the top of the left swimlane and release.
- Repeat for the part properties of the **Avionics** block and the remaining three swimlanes
- The final diagram should appear similar to Figure 6.
- Save and close the project.

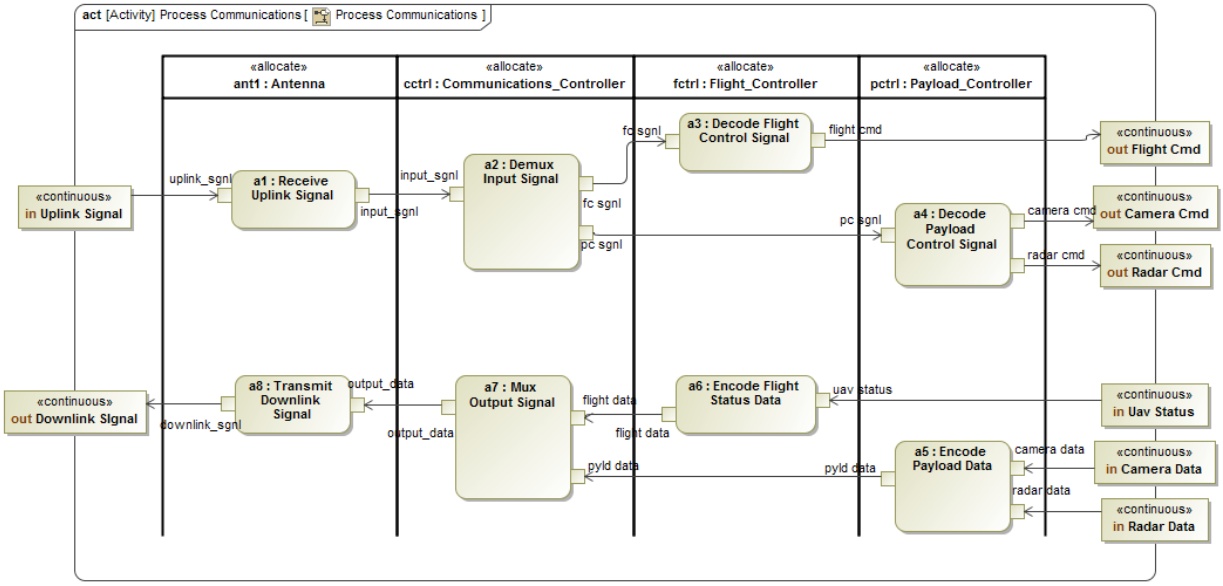

Figure 6 ***Process Communications*** *diagram, final stage*