SysML Hands-On Exercises

Exercise 4.2
SysML Interactions and Sequence Diagrams

MagicDraw

August 2018

OBJECTIVES

The objectives of this exercise are to

- Create an Interaction and Sequence Diagram
- Populate diagram with Lifelines and Messages
- Add time constraints

This process is intended to represent an early step in creating a SysML system model for the UAV system, creating a scenario for user interaction with the system during the concept-of-operations phase.

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 4 course materials onto the computer, specifically Exercise 4.2 Starter UAV.mdzip and Exercise 4.2 Final UAV.mdzip.
3. The student should view the video Introduction to SysML Part 4 Exercise 4.2 in its entirety before attempting the exercise.
4. By this stage, we also recommend installing the ParaMagic plug-in for MagicDraw (ParaMagic 18.0 or later).

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

4.2.1 Start Cameo System Modeler

4.2.2 Open Exercise 4.2 Starter UAV.mdzip

4.2.3 Create an Interaction and Sequence Diagram

- Right-click on the **UAV Domain Behaviors** package in the browser.
- Select Create Element → Interaction.
- Name the interaction **UAV TakeOff**.
- Right-click on the **UAV TakeOff** interaction in the browser
- Select Create Diagram → SysML Sequence Diagram.
- The diagram will automatically be named **UAV TakeOff**.
- Drag three part properties from the browser into the diagram: **uAV:UAV**, **p_stn:Pilot Station**, and **p:Pilot**. Warning: Do not drag the blocks/actors **UAV**, **Pilot Station** and **Pilot** into the diagram. This will create new part properties that duplicate the existing ones.
- The requirements table should appear as in Figure 1.

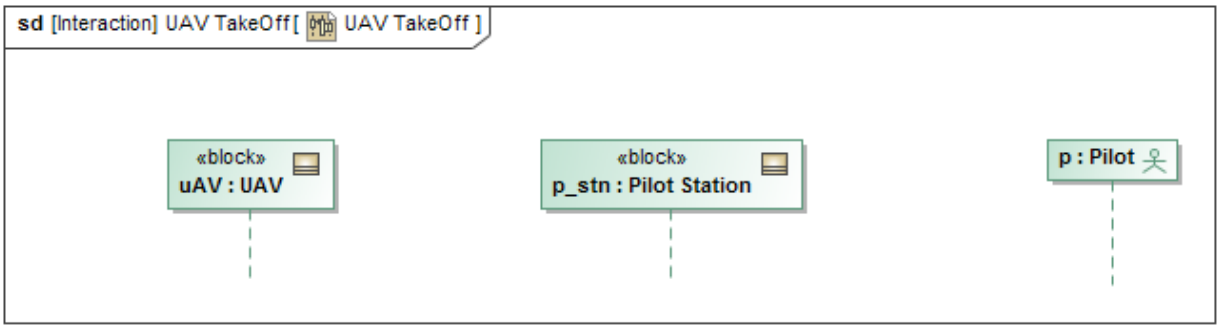

*Figure 1 Creating the **UAV TakeOff** Sequence Diagram*

4.2.4 Add Message to Diagram

- Select the tail (dashed line) of **p:Pilot** in the diagram.
- On the floating toolbar, select the Call Message icon (arrow with parentheses above),
- Drag the end of the message arrow over the tail of the **p_stn:Pilot Station** lifeline, so that it highlights blue, and click to set the end.
- Double-click the first message in the diagram to open its Specification window.
- Click to the right of the Signature (Operation) row.

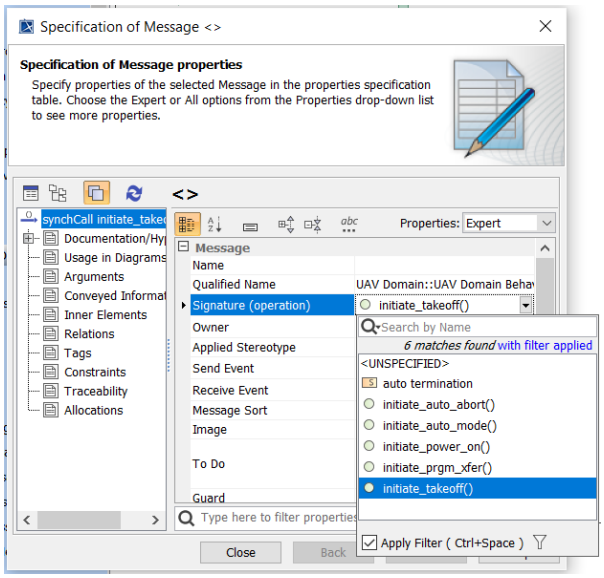

Figure 2 Specification window for message 1.

- On the scroll down list, select **initiate_takeoff()** (see Figure 2).
- Click to the right of the Message Sort row
- On the scroll down list, select asynchCall.
- Click Close.

4.2.5 Add Additional Messages to Diagram

Message	From	To	Signature (Operation)	Message Sort
2	p_stn:Pilot	uav:UAV	load_prgm(prgm)	asynchCall
3	p:Pilot	p_stn:Pilot	initiate_power_on()	asynchCall
4	p_stn:Pilot	uav:UAV	power_on()	synchCall
5	uav:UAV	p_stn:Pilot	Name = **confirm**	reply
6	p:Pilot	p_stn:Pilot	initiate_takeoff()	asynchCall
7	p_stn:Pilot	p:Pilot	Name = **confirm takeoff?**	asynchSignal
8	p:Pilot	p_stn:Pilot	Name = **confirm**	asynchSignal
9	p_stn:Pilot	uav:UAV	prepare_takeoff()	synchCall
10	uav:UAV	p_stn:Pilot	Name = **confirm**	reply
11	p_stn:Pilot	uav:UAV	takeoff()	asynchCall

- In Message 2, the operation call needs an argument, Profile_B.
  - Double-click Message 2 to open the Specification window.
  - In the left-hand box, click on Arguments
  - There is only one argument. To the right of **in prgm,** enter **Profile_B.**
  - Close Specification window.
- In Messages 5, 7, 8, and 10, there is no need to select a Signature (Operation). Enter the text shown as the Name of the message.

4.2.6 Duration Constraints to Diagram

- In the Diagram Toolbar, under the Sequence Diagram heading, select Duration Constraint
- Click Message 4, drag end of constraint to Message 5 so that it highlights blue, and click to set end
- Drag the constraint arrow to the left of the messages as shown in Figure 3.
- Double-click the double-headed duration constraint arrow in the diagram to open the Specification window.
- Enter 30 for Min and 60 for Max, then close window.
- Repeat these steps for a duration constraint between Message 9 and Message 10, with a range of 10..20.
- Save and close the project.

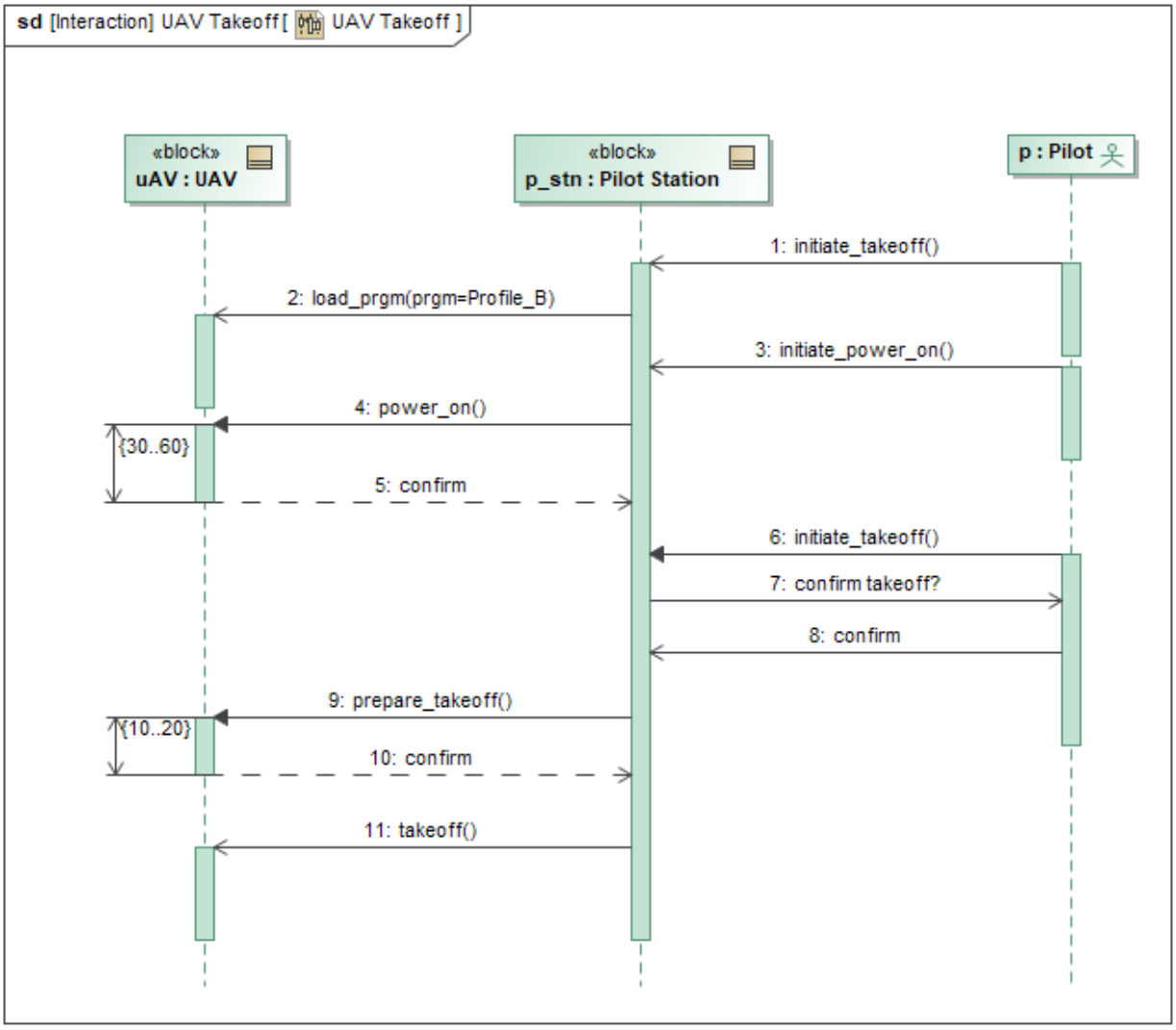

Figure 3 UAV REQ, Final