



SysML Hands-On Exercises

Exercise 2.1 SysML Blocks and Block Definition Diagrams

MagicDraw

August 2018

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OBJECTIVES

The objectives of this exercise are to

- Create a block definition diagram
- Populate it with blocks from the containment tree
- Use part property relationships to show system composition

In the process, we will create the domain-level composition for the UAV system.

PREPARATION

1. This exercise assumes the student has Cameo System Modeler 19.0/MagicDraw 19.0 with SysML (or later) installed correctly on his or her machine with a valid license for use.
2. The student should load the Part 2 course materials onto the computer, including specifically Exercise 2.1 UAV Starter UAV.mdzip.
3. The student should view the video Introduction to SysML/Part 2/Exercise 2.1 in its entirety before attempting the exercise. In lieu of putting many screenshots in this document, we recommend reviewing portions of the video, as needed, during the exercise.

Note that additional software tools will need to be installed to complete Part 5, including a parametric solver and math engine to execute the parametric models created. If not already installed, the student should begin the process of obtaining and installing these tools. For assistance, contact info@intercax.com.

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

2.1.1 Start Cameo System Modeler/MagicDraw

2.1.2 Open a MagicDraw Project

- Left-click File in menu bar
- Select Open Project
- Browse to Exercise 2.1 Starter UAV.mdzip
- Click Open

2.1.3 Create a Block definition diagram

- In the Containment Browser, right-click the package **UAV Domain** and select Create Diagram → SysML Block Definition Diagram (see Figure 1).

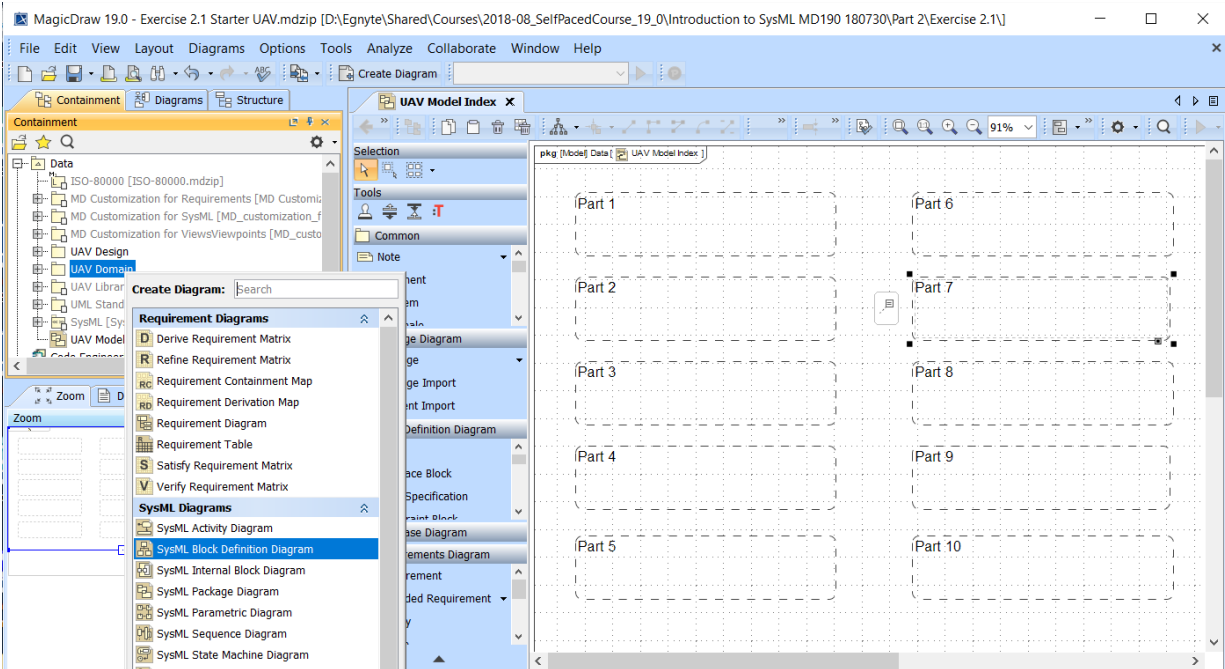


Figure 1 Creating a BDD

- In the Containment Browser, enter the diagram name **UAV Domain BDD** in the highlighted blue field. See
- (Alternate) If you are unable to enter the diagram name while the field is highlighted, right-click the diagram in the browser, select Rename, and enter the name.

2.1.4 Populate the Diagram

- Select the seven blocks and two actors under the **UAV Domain** package in the browser
- Drag them into the diagram.
- Expand the package **UAV Design** in the browser.
- Drag the block **UAV** into the diagram
- The initial arrangement of the elements in the diagram should be similar to Figure 3 Initial arrangement in UAV Domain BDD.
- Resize and rearrange the symbols as shown in Figure 4.

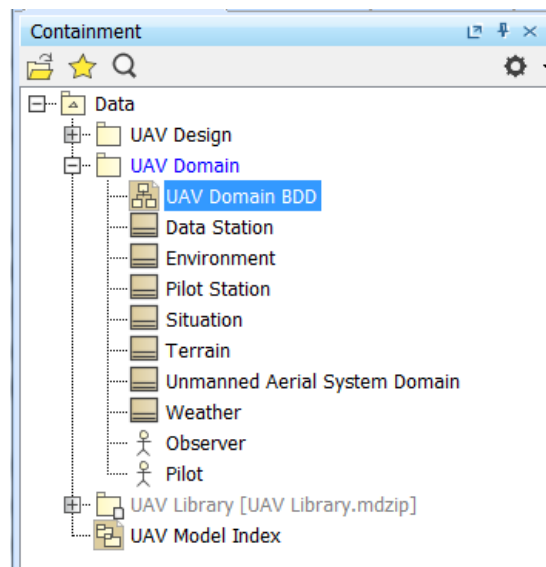


Figure 2 New Diagram in Browser

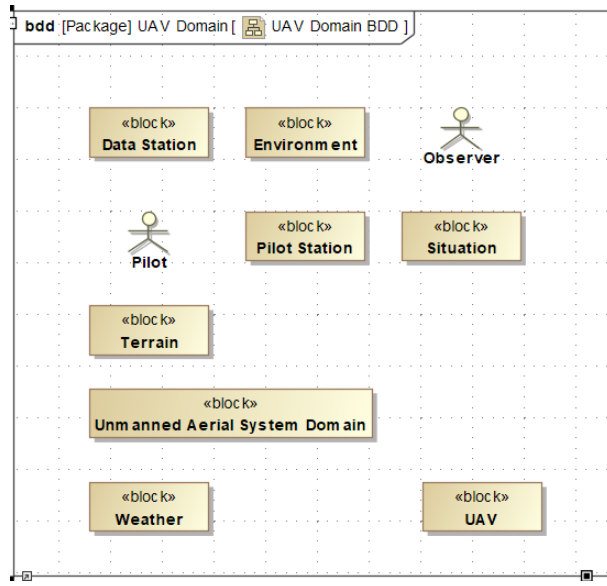


Figure 3 Initial arrangement in UAV Domain BDD

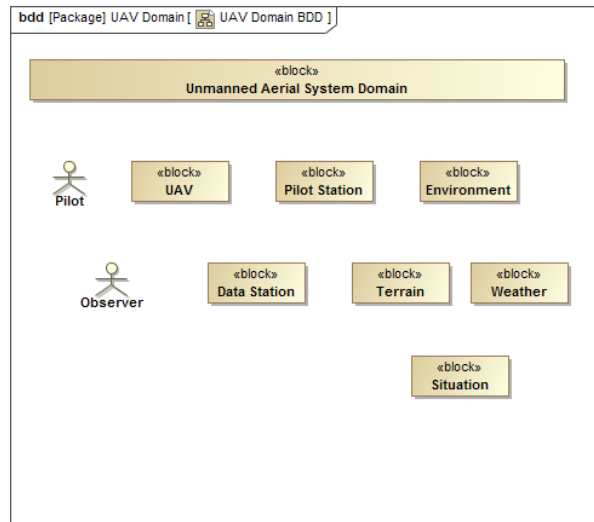


Figure 4 Final arrangement in UAV Domain BDD

2.1.5 Create Part Property Relationships for Environment

- In the diagram, select the **Environment** block.
- In the floating toolbar, select the “black diamond arrow”, formally Directed Composition.
- Move the cursor over the **Terrain** block so that it highlights with a blue outline.
- Click inside the **Terrain** block. A black diamond arrow is created from the **Environment** block to the **Terrain** block (see Figure 6).
- Repeat the process to for the **Situation** and **Weather** blocks. See Figure 7.

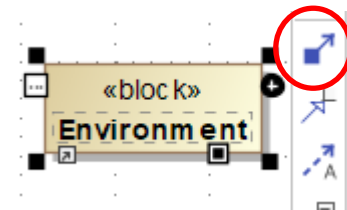


Figure 5 Directed Composition icon

2.1.6 Create Part Property Relationships for Unmanned Aerial Vehicle Domain

- Repeat the process in the previous step for the **Unmanned Aerial Vehicle Domain** block, creating part property relationships with **Pilot**, **Observer**, **UAV**, **Pilot Station**, **Data Station**, and **Environment**.
- The browser should appear as shown in Figure 8. Note that **Unmanned Aerial Vehicle Domain** and **Environment** have multiple part property entries underneath them. The blue coloring indicates that these changes to the model have not been saved.

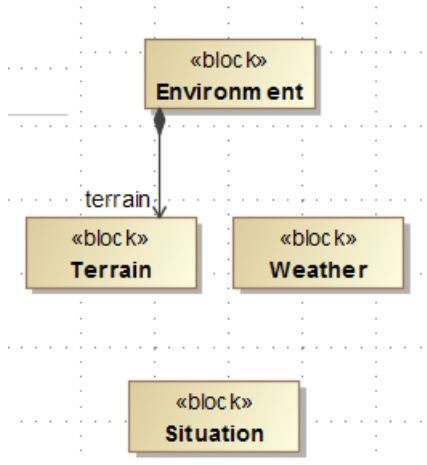


Figure 6 First part property relationship

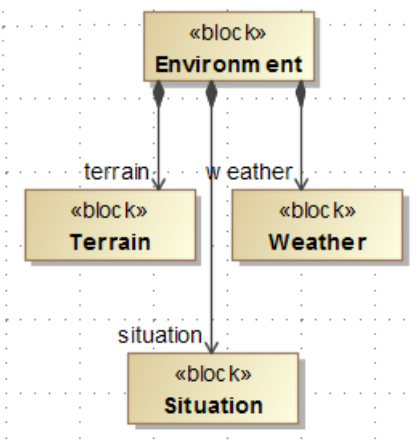


Figure 7 Three part properties

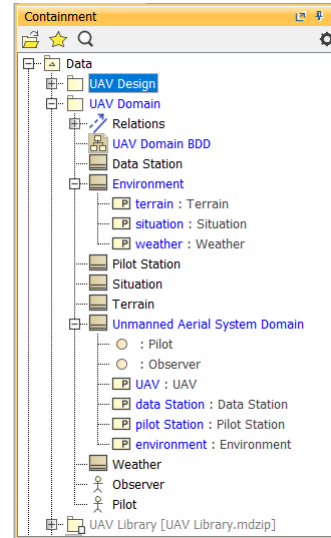


Figure 8 Part Properties in Browser

- Rename the part properties as shown in Figure 9.
- Save the project.

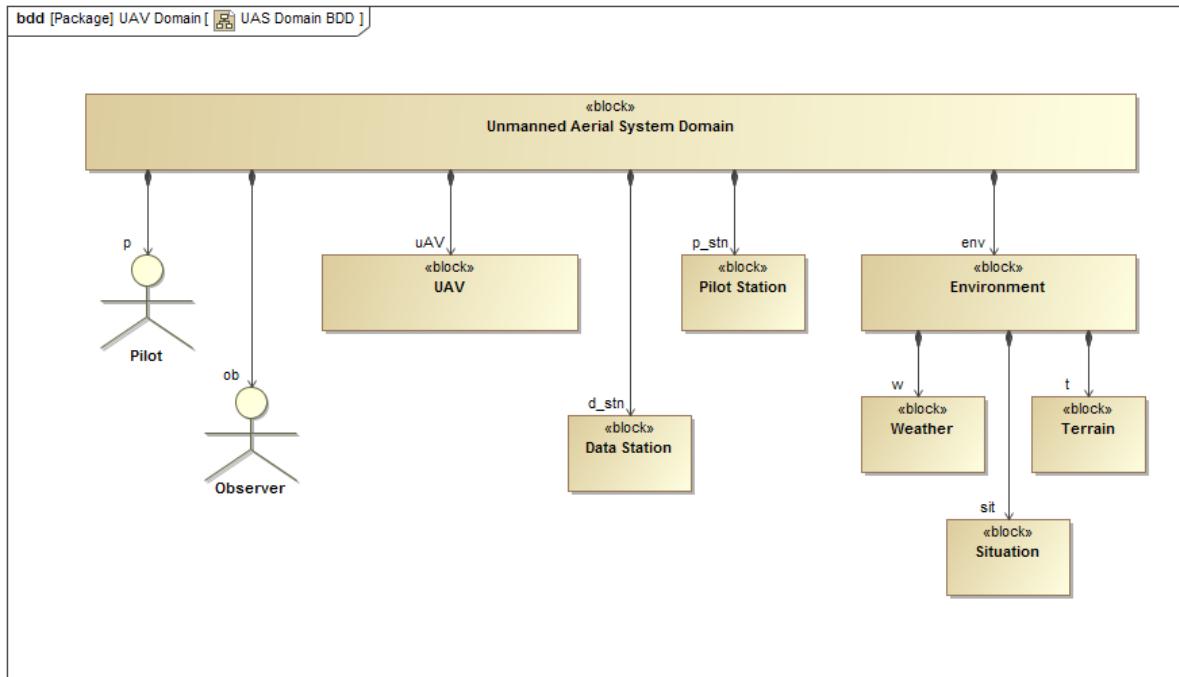


Figure 9 Final Block Definition Diagram UAV Domain BDD