SysML Hands-On Exercises

Exercise 7.3
SysML Internal Block Diagrams

MagicDraw

August 2018

OBJECTIVES

The objective of this exercise are to

- Create an Internal Block Diagram using Proxy Ports, Full Ports and Item Properties

This process is intended to represent specifying part of the internal connectivity for the communications processing components 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 7 course materials onto the computer, specifically Exercise 7.3 Starter UAV.mdzip and Exercise 7.3 Final UAV.mdzip.
3. The student should view the video Introduction to SysML Part 7 Exercise 7.3 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

7.3.1 Start Cameo System Modeler

7.3.2 Open Exercise 7.3 Starter UAV.mdzip

7.3.3 Create an Internal Block Diagram

- Right-click the **Payload** block in the browser. Select Create Diagram → SysML Internal Block Diagram.
- Select parts to display as shown in Figure 1. Check the boxes for the three part properties and5 proxy ports of Payload. Uncheck boxes for constraint, value and reference properties, which will not be used in this exercise.
- Rearrange the parts and ports so that the diagram appears similar to Figure 2.
- Name the diagram **Payload IBD**.

7.3.4 Create Full Ports for the Radar, Video Camera and Thermal Camera blocks

- Right-click the **UAV Design** package and select Create Element → Block.
- Name the Block **Camera Connector**.
- Right-click the **Camera Connector** block and select Create Element → Proxy Port.
- Double-click the new proxy port to open the specification window (**Error! Reference source not found.**). Set the Type to the interface block **CameraControl**, check the *Is Conjugated* box, and set the name to **p1**.
- Add two additional proxy ports to the **Camera Connector** block in the same way, using Table 1 as a guide.

Name	Type	Is Conjugated	Multiplicity
p1	Camera Control	yes	Unspecified
p2	Camera Data	no	Unspecified
p3	Power	yes	Unspecified

*Table 1 Proxy ports for **Camera Connector** block*

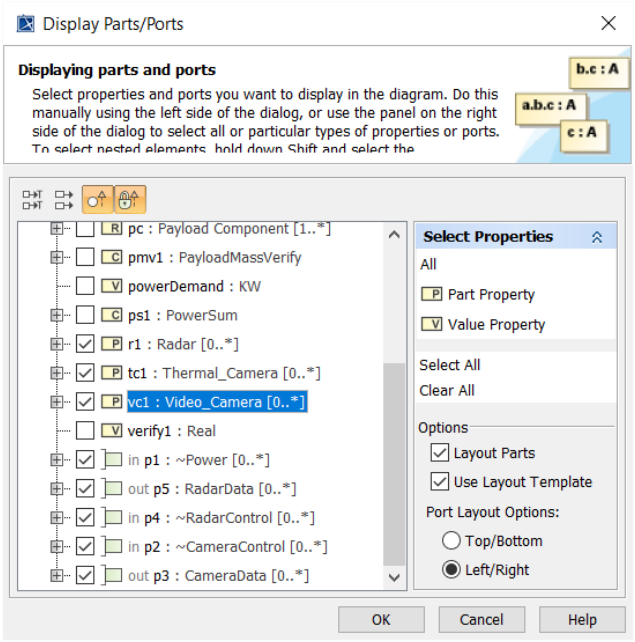

Figure 1 Display parts for internal block diagram

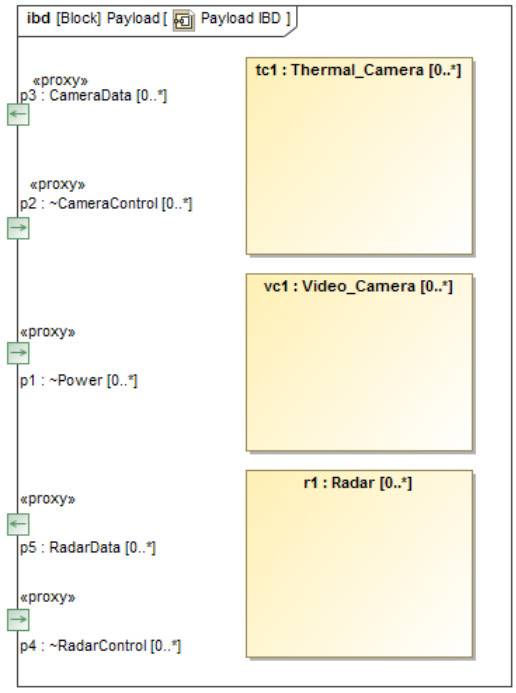

Figure 2 Payload IBD, first stage

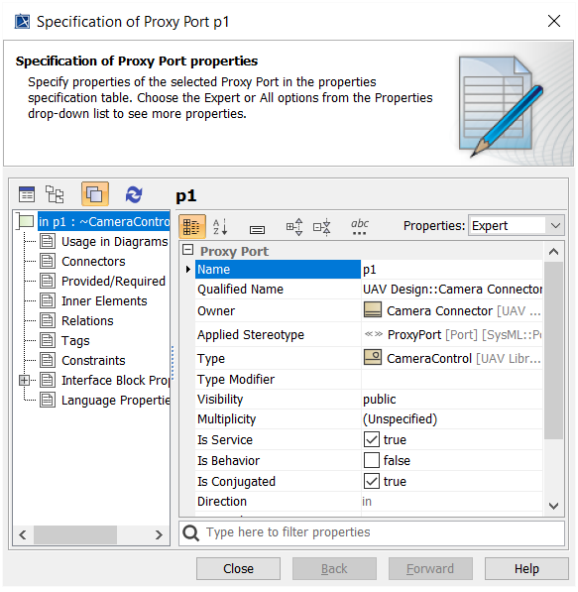

Figure 3 Specification window for proxy port

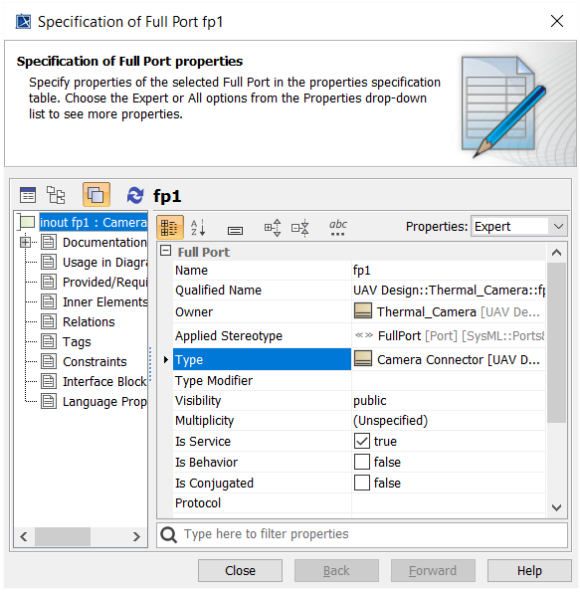

Figure 4 Specification window for full port

- Repeat the process for the **Radar Connector** block, using Table 2 as a guide.

Name	Type	Is Conjugated	Multiplicity
p1	Radar Control	yes	Unspecified
p2	Radar Data	no	Unspecified
p3	Power	yes	Unspecified

Table 2 Proxy ports for Radar Connector block

- Right-click the **Thermal Camera** block in the browser. Select Create Element → Full Port. Open the specification for the full port (Figure 4), set the name to **fp1** and the Type to **Camera Connector**.
- Add a full port of the same type and name to the **Video Camera** block
- Add a full port of type **Radar Connector** to the **Radar** block.
- In the diagram, click **tc1:Thermal Camera** and select the Display All Ports icon on the floating toolbar. Repeat the process for **vc1: Video Camera** and **r1:Radar Camera**. Resize the full ports. The diagram should appear as in Figure 5.
- In the diagram, click **fp1: Camera Connector** and select the Display All Ports icon on the floating toolbar. Accept all proxy ports for display. Repeat the process for the other two full ports**.** The diagram should appear as in Figure 6 if the proxy port labels are dragged to the right.

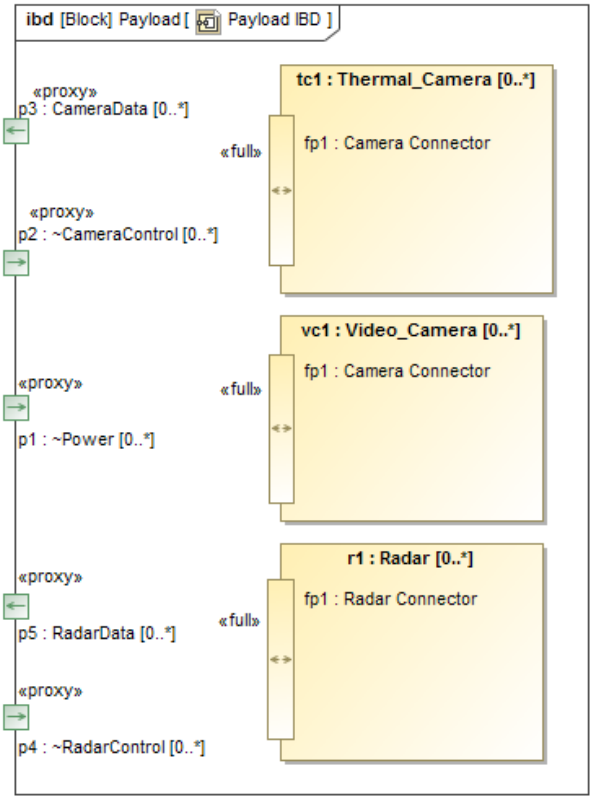

Figure 5 Payload IBD, second stage

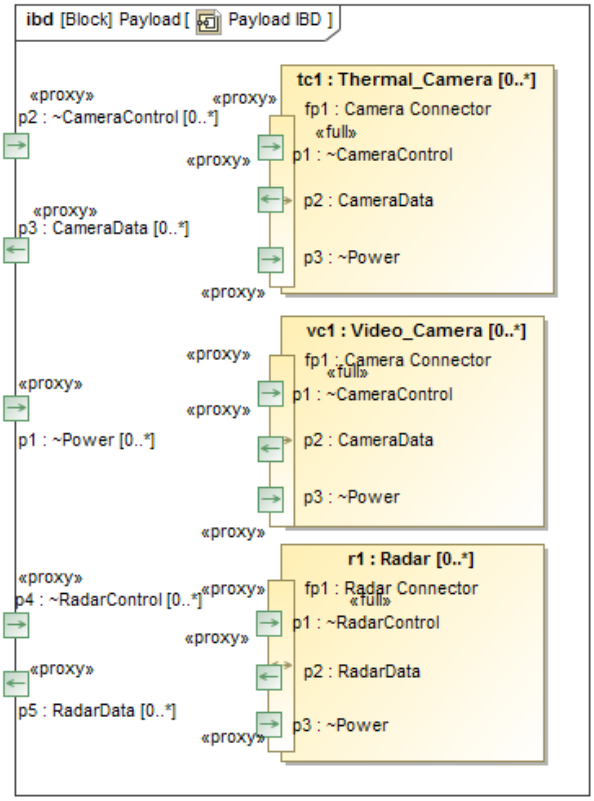

Figure 6 Payload IBD, third stage

- Draw connectors between the proxy ports on the diagram frame and on the parts as shown in Figure 7.

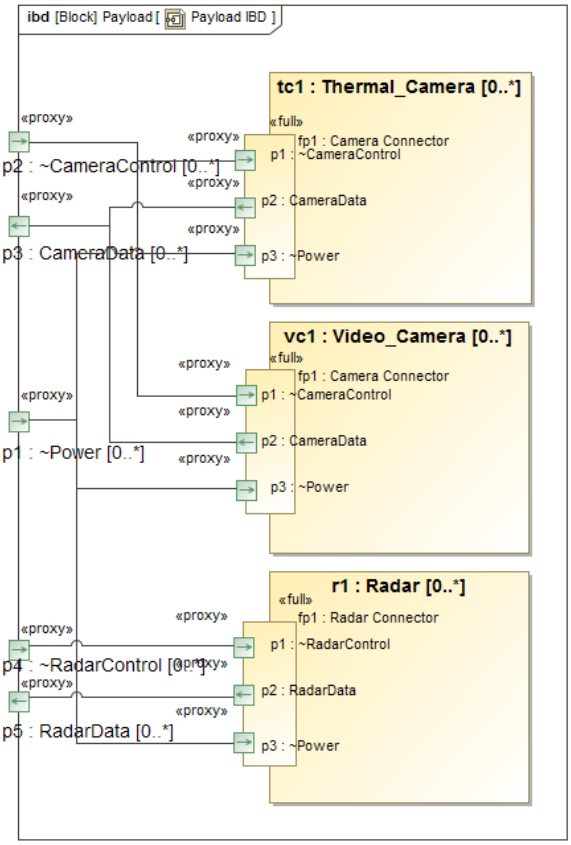

Figure 7 Payload IBD, fourth stage

7.3.5 Create Item Properties for the Payload block

- Right-click the **Payload** block in the browser and select Create Element → Part Property.
- Name the Part Property **pwr1** and set the type to **DC**.
- Use Copy and Paste inside the **Payload** block to create **pwr2:DC** and **pwr3:DC**.
- Click on the connector that runs from **p1:~Power** on the diagram frame to **p3:~Power** on the thermal camera part.
- Open the specification window for the connector and choose Item Flow from lefthand list (Figure 8).
- Click Add.
- In the next window (Figure 9), set the direction from **p1** to **p3** and click the browse button to the right of Item Property.
- In the final window (Figure 10), expand the tree and double-click **pwr1:DC**.
- Click OK, OK, and close to return to the IBD.

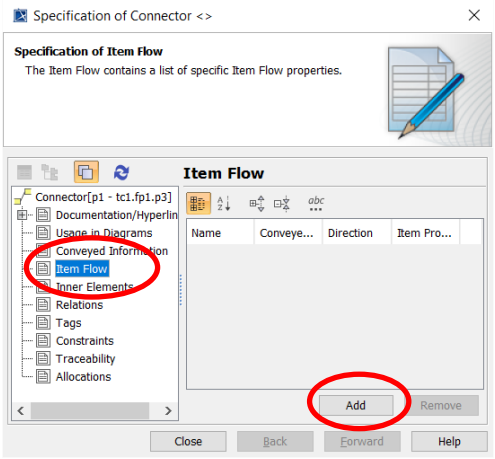

Figure 8 Adding Item Flow

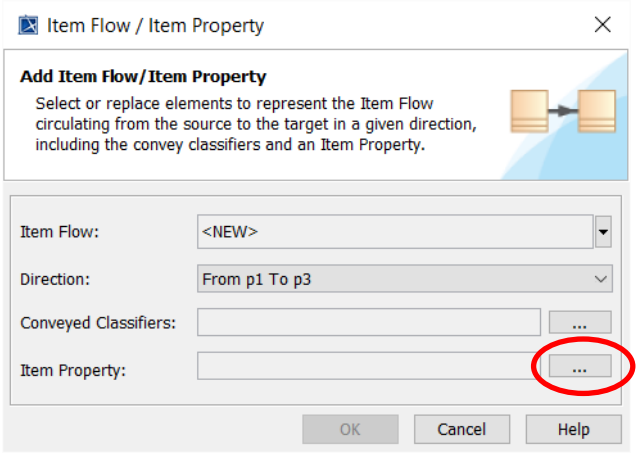

Figure 9 Setting Item Property

- Repeat the process for **pwr2:DC** and the connector that runs from **p1:~Power** on the diagram frame to **p1:~Power** on the video camera part. Set the direction from **p1** to **p3**.
- Repeat the process for **pwr3:DC** and the connector that runs from **p1:~Power** on the diagram frame to **p1:~Power** on the radar part. Set the direction from **p1** to **p3**.
- The final diagram should appear similar to Figure 11.
- Save and close the project.

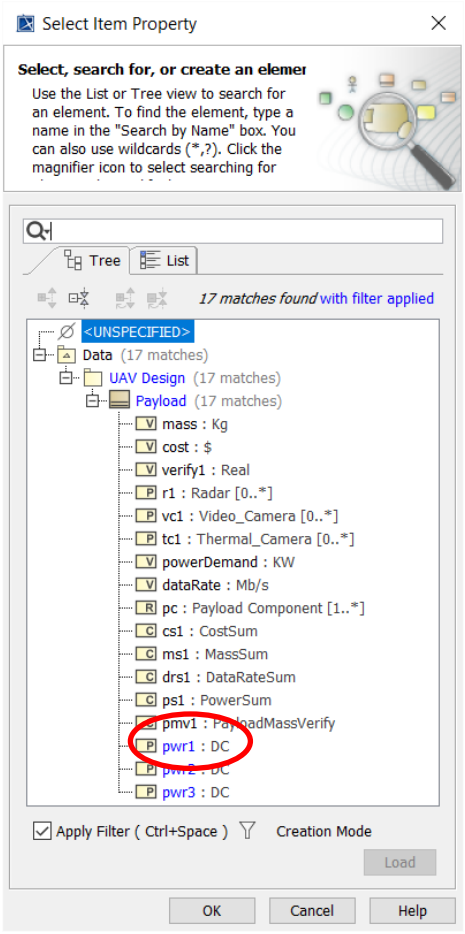

Figure 10 Selecting Item Property

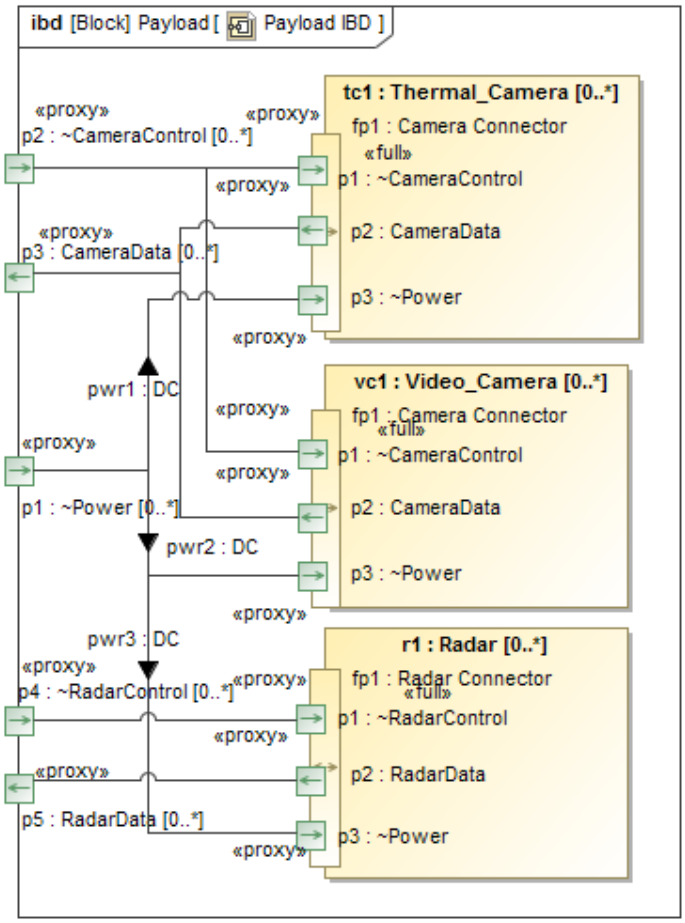

Figure 11 Payload IBD, final stage